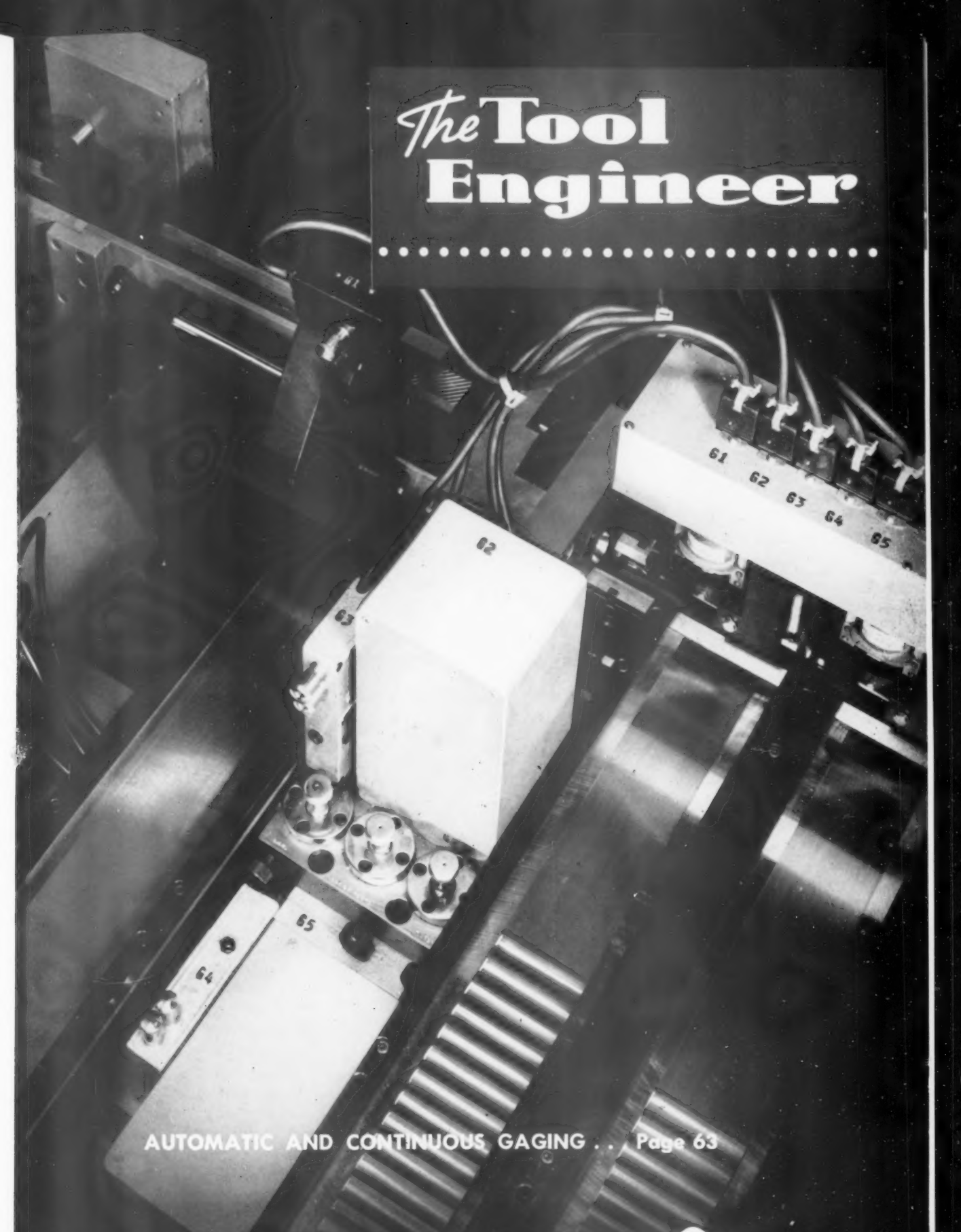


The Tool Engineer

AUTOMATIC AND CONTINUOUS GAGING . . . Page 63

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

Here's How Heald helps you cut down on "down time"

easy access to power units just one of many Bore-Matic features for easier service inspection

An occasional service inspection is your best assurance of trouble-free machine operation on any type of equipment. And in all Heald machines, inspection time has been cut to the minimum by making all parts so easy to get at.

Take the hydraulic power plant of a Heald Bore-Matic, for example. A few simple disconnects, and the entire pump tank and motor unit can be rolled right out of the base. Or, on the larger size machines, the power unit is completely accessible simply by removing guards or covers.

Electrical control cabinets are positioned well above the floor, in a safe, convenient, and trouble-free electrical "headquarters". The main hydraulic control panel at the front of the machine is exposed by removing a single guard. These and other Bore-Matic features mean less time out for servicing—more production time on the job.

HEALD

Heald machines speed the nation's production

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

VOLUME XXIX
NUMBER 1
JULY, 1952

The Tool Engineer

Contents

TECHNICAL ARTICLES

The Responsibility of Leadership . . . . . By L. B. Bellamy 29
Metal Cutting Temperatures and Tool Wear (Part I) . By A. O. Schmidt 33
New Precision Reference Specimens for Surface Finish Control . . . By C. R. Lewis and A. F. Underwood 36
Determining Number of Die Cavities . . . . . By G. W. K. Clark 40
Broaching of Internal Gears (Part I) . . . . . By Joseph A. Psenka 41
Designing for Efficiency: Nomograph for Determining the Period of Physical Pensulum . By Leonard M. Majeske 45
Heat-Treating and Machining of Boron Steels (Part I) . . . . . By J. D. Graham 46
Simplified Machine Shop Control . . . . . By Roy Palmer 49
Multiple Screw Machine Tooling and Methods . . . . By C. R. Morgan 51
An Analysis of Cost Estimating Principles and Practices (Part III) . . . . By Lawrence E. Doyle 55
Tool Engineering Data 59

TOOL ENGINEERING IN ACTION

Automatic Gaging for In-Line Production . . . . By Robert T. Kimmel 63

GADGETS

Holding a Drill Press Vise . . . . . By Tom Brown 61
Wire Mock-up . . . . . By Charles A. Haugk 61
Spring-loaded Center . . . . . By George Hooey 61
Cam Follower . . . . . By W. S. Boll 62
Split Type Casting Support . . . . . By Frank J. Peragine 62
Indicator Extension . . . . . By Roger Isetts 62

ASTE NEWS

South West Area Meeting Held May 30-31 . . . . By Nancy L. Morgan 71

DEPARTMENTS

Abstracts of Foreign Technical Literature, 113
Good Reading, 118
Letter from the Editor, 31
News in Metalworking, 86
North, East, West, South in Industry, 116
Technical Shorts, 119
Tools of Today, 89
Trade Litearture, 120
Advertisers Index, 206

THE TOOL ENGINEER is regularly indexed in *The Industrial Arts Index.*

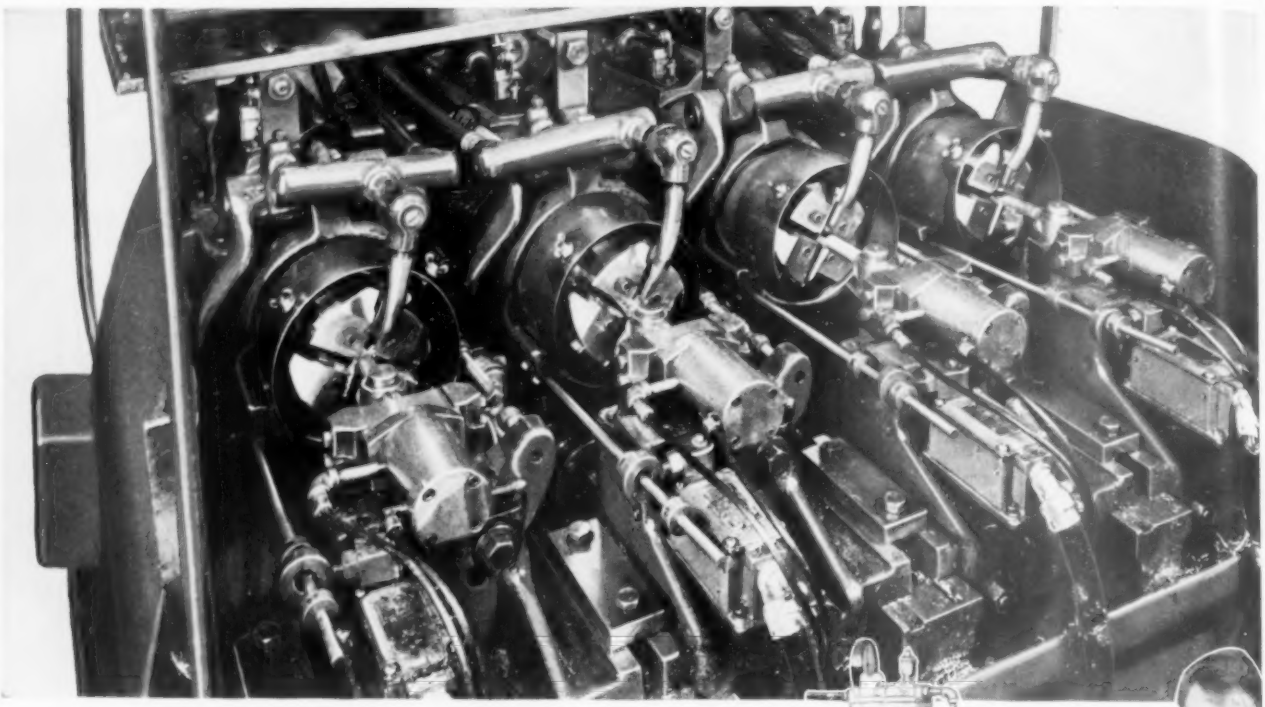
AMERICAN SOCIETY OF TOOL ENGINEERS

THE TOOL ENGINEER is published monthly in the interest of the members of the American Society of Tool Engineers. Entered as second-class matter, November 4, 1947, at the post office at Milwaukee, Wisconsin, under the Act of March 3, 1879. Yearly subscription for members, $2.00. Non-members, $6.00. Canada, $6.50; all other countries, $8.00 per year.

OFFICE OF PUBLICATION: 239 E. Chicago St., Milwaukee, Wis.
EXECUTIVE AND EDITORIAL OFFICES: 10700 Puritan Ave., Detroit 21, Michigan.

Labor Cost Slashed 50%

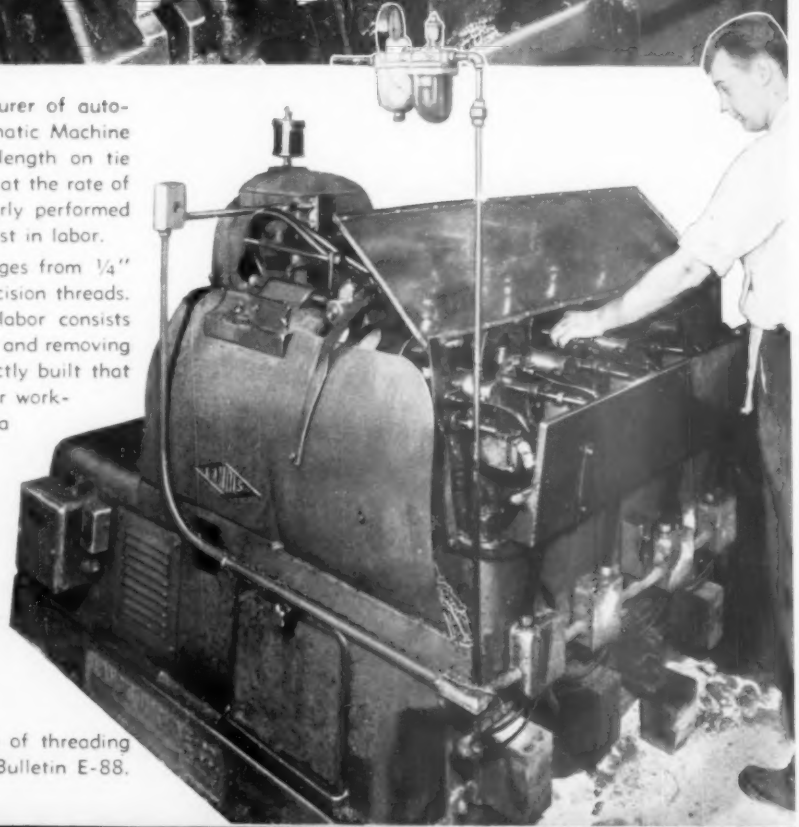
...WITH ***LANDIS*** SEMI-AUTOMATIC MACHINE



Illustrated in the plant of a large manufacturer of automobile parts is a LANDIS 4 Spindle Semi-Automatic Machine mass-producing 7/16" 18-P threads 2¼" in length on tie rod sockets. The threads are cut to a Class 3 fit at the rate of 520 pieces per hour. This operation was formerly performed on a double-spindle machine . . . at twice the cost in labor.

This machine, whose diametrical capacity ranges from ¼" to 1", is designed for the mass-production of precision threads. During the operation illustrated here, manual labor consists merely of placing the blanks on work-holding pins and removing them when threaded. The machine is so compactly built that one operator can easily reach any one of the four work-loading stations from a fixed central position—a feature which enables one man to do the work of two with minimum operating fatigue.

Through the combined output of four die heads, high production is obtained at comparatively low spindle speeds. This feature not only results in finer thread finish, but also greatly extends chaser life, thus effecting a sharp reduction in tool cost. Other advantages inherent in the LANDIS 4 Spindle Semi-Automatic Machine include: quick set-up; thread concentricity; elimination of side-shave; and adaptability to a wide range of threading operations. For complete information, write for Bulletin E-88.



LANDIS *Machine* COMPANY · WAYNESBORO PENNSYLVANIA

HARDINGE

HARDINGE
ELMIRA, N.Y.

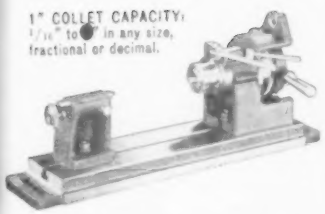
COLLET INDEX FIXTURES

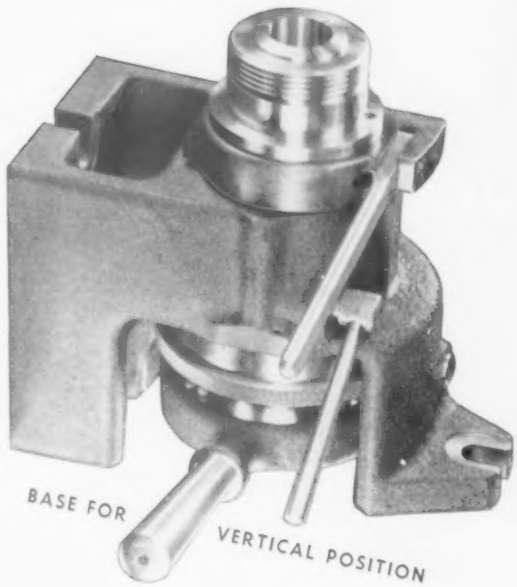
Speed Production and Hold Work Accurately

This fixture will take both step chucks and jaw chucks in addition to standard collets; your tool room will not have to make special fixtures.

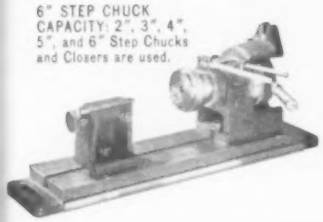
A Preselector Index Plate makes possible the separate indexing of any number divisible into 20 or 24. Quick opening and closing of collets and step chuck, with 100 to 1 closer lever.

1" COLLET CAPACITY: 1/16" to 1" in any size, fractional or decimal.

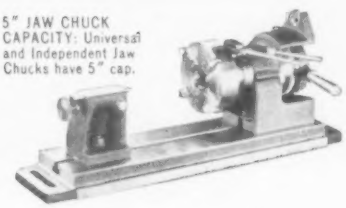




6" STEP CHUCK CAPACITY: 2", 3", 4", 5", and 6" Step Chucks and Closers are used.



5" JAW CHUCK CAPACITY: Universal and Independent Jaw Chucks have 5" cap.



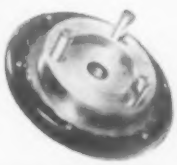
For full information write for Bulletin CIF.

HARDINGE-SJOGREN

SPEED COLLET CHUCKS—*Fast and Accurate*

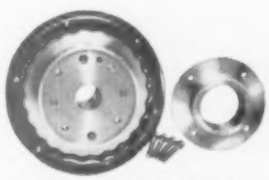
The Hardinge-Sjogren Speed Collet Chuck gives greater capacity, saves time, insures accuracy and better results. It is readily adapted for use on all tool room and engine lathes. Keys and wrenches eliminated . . . a turn of the handwheel automatically opens or closes the collet, releasing or locking the work as desired. Its grip is adjustable and sure. No waste motion . . . the operator is always in front of his work, production increased.

Available in 1", 1⅜", 2¼", 3½" collet capacity. Write for Bulletin 8.



for CAM-LOCK SPINDLES

for Tapered KEY-DRIVE SPINDLES



for THREADED NOSE SPINDLES

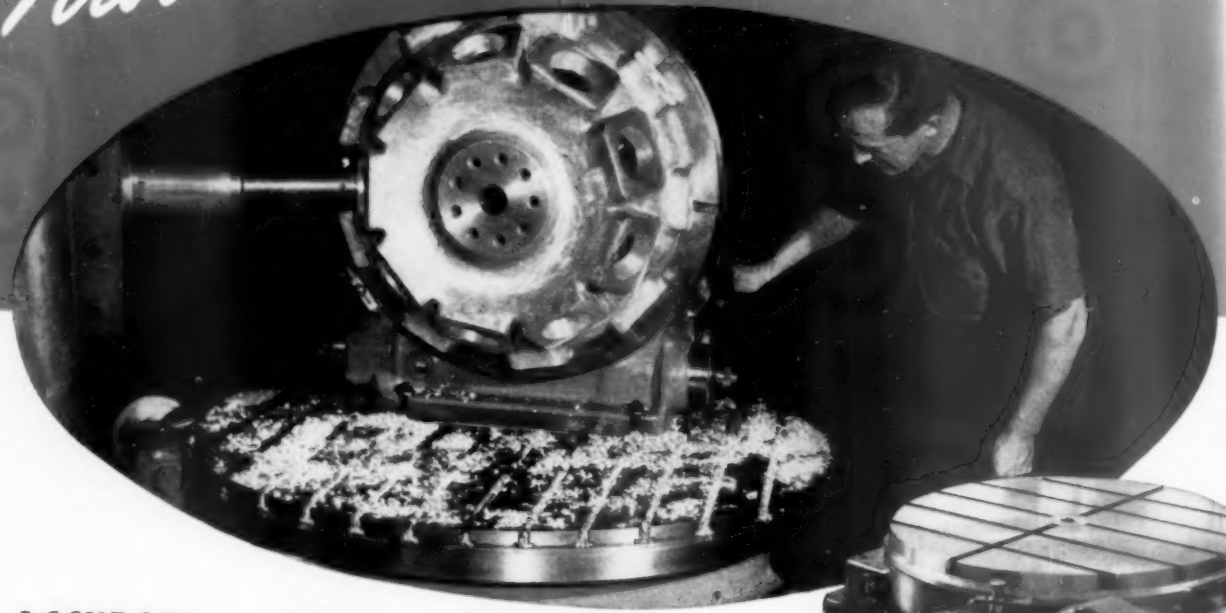
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

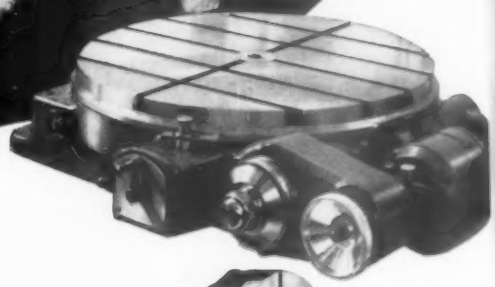
PRATT & WHITNEY

Rotary Tables

First Choice

FOR PRECISE CIRCULAR SPACIN
AND ANGULAR POSITIONING—
10 inch TO 50 inch DIAMETE





ACCURATE • FAST • ADAPTABLE

3 Basic Types

PLAIN
TILTING
VERTICAL

Pratt & Whitney Rotary Tables produce highly accurate work . . . faster, more efficiently and with definite assurance of "job precision." Indexing at simple or compound angles is obtained rapidly and easily for drilling, tapping, boring, reaming and face milling operations and for stage and final inspection checks. Every P&W Rotary Table is machined, assembled and inspected to rigid standards of accuracy.

Plain Rotary Tables . . . 12" and 20" diameters
Motor Driven Plain Rotary Tables . . . 24", 30", 42", and 50" diameters
Tilting Rotary Tables . . . 10", 16", and 24" diameters
Motor Driven Vertical Rotary Tables . . . 30" diameter

For complete information, write on your Company letterhead to your nearby Pratt & Whitney Branch Office listed below.

PRATT & WHITNEY
DIVISION NILES-BEMENT-POND COMPANY
WEST HARTFORD 1, CONNECTICUT, U. S. A.

First Choice for Accuracy

Branch Offices . . . BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS (The Stanco Co.) • DETROIT • HOUSTON (The Stanco Co.) LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER • SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., WEST HARTFORD

MINOR in size yet a MAJOR new addition to STANDARD DIAL BORE GAGES

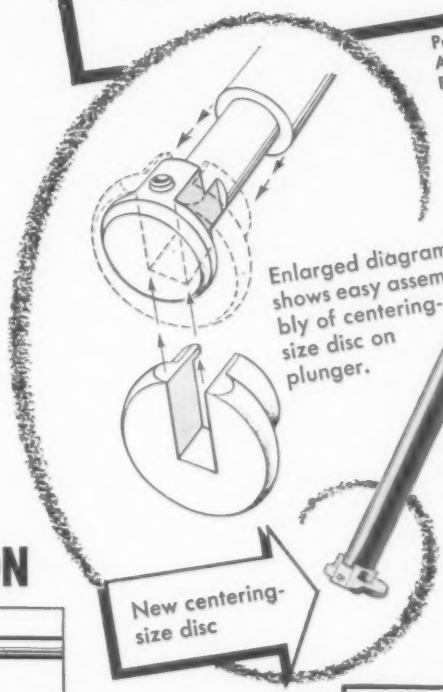
NEW #00 uses centering-size discs for checking bores from 1/4" to 3/8"

★ Designed for tolerances up to .005"
★ Sapphire tipped gaging plunger
★ Chrome plated centering-size discs assure long "precision-service"

YES, Standard Gage, pioneer of dial bore gages, has developed a still newer type of dial gage for quick, accurate inspection of small diameter bores from .250" to .375". The ultimate in precision gaging of small bores, STANDARD'S No. 00 is based on an entirely new "interchangeable disc" principle, surprisingly simple in design, easy to set and easy to use.

- Readily entered in bore
- Holds its setting
- Gives positive repeat readings
- High visibility dial graduations of .0001" are easy to read

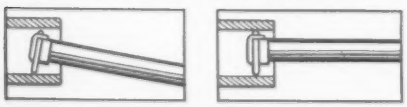
Sapphire tipped gaging plunger and chrome-plated centering-size discs insure a long, trouble-free gaging life.



Photograph actual size

A turn of the knurled clamping nut releases centering-size disc or locks it firmly in place.

EASE OF OPERATION



Gage is entered at an angle to allow extended plunger to clear the bore, then rocked to cause plunger to pass a square position while noting minimum reading on the indicator.

When ordering be sure to state nominal size of bore and tolerance desired

EASY "SIZE CONVERSION"

Conversion to various sizes in the range from .250" to .375" is accomplished by the quick interchange of centering-size discs on the same head by the one-step operation of turning a clamping nut. Positive locking action of this nut insures holding set dimension. Centering-size discs are furnished to suit dimensions of bore to be checked. No. 00 will check to within 1/16" of the bottom of a blind hole.

Now 8 sizes cover range of 1/4" to 16" in STANDARD'S line of Dial Bore Gages.
Write for new complete Catalog C showing these and other gages.

STANDARD GAGE CO., INC., Poughkeepsie, N.Y.

TRAINED TO SERVE YOU

Got a tough tapping problem? Ask your WINTER Distributor to make available the services of a factory trained Service Engineer. No obligation.

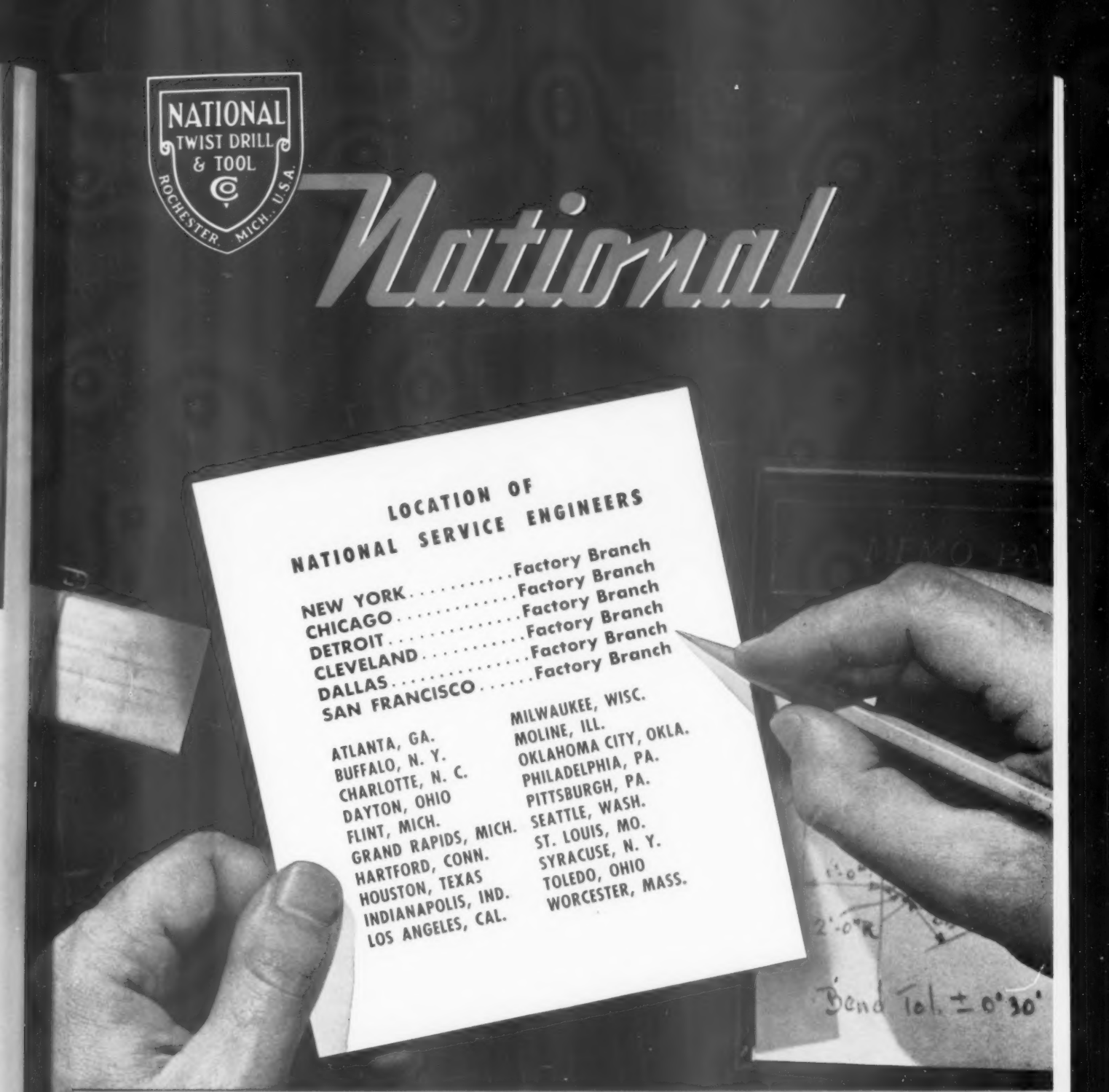
WINTER BROTHERS COMPANY
Rochester, Mich., U.S.A.

Distributors in principal cities. Branches in New York, Detroit, Chicago, Dallas, San Francisco. Division of National Twist Drill & Tool Company.

ALWAYS AT YOUR SERVICE

Your local Industrial Supply Distributor carries a complete stock of WINTER Taps.

WINTER



NATIONAL SERVICE IS NATIONWIDE

When you buy a **NATIONAL** Tool you buy personal service as well. To get the most out of your tools call for a qualified Service Engineer through your nearby **NATIONAL** Distributor.

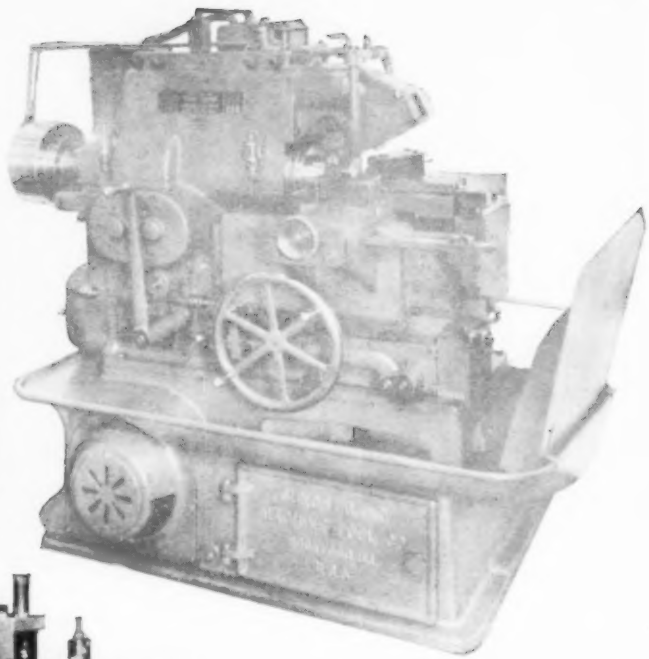
CALL YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

. . . for all your staple industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs, and special tools.

NATIONAL TWIST DRILL & TOOL COMPANY, Rochester, Michigan, U. S. A.

Distributors in principal cities. Factory Branches: New York, Chicago, Cleveland, Detroit, Dallas, San Francisco.

New Design Features Plus Automatic Cycling Increases Production From 40 to 250 Gear Blanks Per Hour



The Sundstrand Lathe above, was built in 1930 and had manual approach and return — It represented a modern production lathe of that time, turning 40 bevel gear blanks an hour.

This modern Sundstrand Automatic Lathe, with its new design features and automatic cycling, today turns comparable bevel gear blanks at the rate of 250 an hour.

SUNDSTRAND

RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

Some of the design features that make this production possible

The 8000 or more users have always found Sundstrand Automatic Lathes a profitable investment. Many have changed from old to new Sundstrand Automatic Lathes in order to get even higher productivity as a result of design improvements. The following features incorporated in the design of the latest models of Sundstrand Automatic Lathes will help you increase production.

Greater Horsepower

All new Sundstrand Automatic Lathes have been redesigned for greater rigidity and larger spindle drive motors. They have ample power for use of carbide cutting tools and are capable of doing more work.

Wider Speed Range

Spindle speed range ratios have been increased to 30 to 1 to obtain maximum in cutting efficiency over a wider range of sizes of parts and material. The spindle unit is equipped with two driving gear centers, which increase the range between high and low spindle speeds. In addition, four speed changes can be obtained from one set of gears instead of the usual two.

Wider Feed Range

A wider feed range has been provided to enable the handling of a greater range of parts and materials at maximum cutting efficiency. The New Models 4A, 8A, and 12A have a ratio of 18 to 1 between high and low feeds — Model 16 has an even greater range.

Greater Carriage Adjustment

Both front and rear carriage of the latest Sundstrand Automatic Lathes are adjustable full length between headstock and tailstock centers — another important new feature.

Faster Set-Up

Convenient location of pick-off gears for changing spindle speeds and front and rear carriage feeds is provided. Feed and speed chart and pick-off gear storage compartment are readily accessible for quick set-up or changeover.

Quick Cycle Changeover

Complete control of all cycles is provided by adjustment of dogs on a disk. Making cams is eliminated. Changing position of dogs on disk changes length of rapid approach, feed and rapid return strokes — enables operator to set up cycle quickly and change over from one job to another easily.

Automatic De-Clutching

All new models have been provided with automatic declutching between spindle and spindle motor with self-adjusting magnetic clutch and brake for quick stopping of spindle rotation.

Screw Feed to Front Carriage

All new Sundstrand Automatic Lathes have screw instead of rack feed to the front carriage — resulting in fine finish and long tool life.

4 Models Cover HP Range of 3 to 75 HP

	MODEL 4A	MODEL 8A	MODEL 12A	MODEL 16
SPINDLE MOTOR	3 to 7½ HP	10 to 25 HP	20 to 50 HP	50 to 75 HP
SPEED RANGE (Type A) (Type B)	60 to 1800 RPM 120 to 3600 RPM	40 to 1200 RPM 60 to 1800 RPM	30 to 900 RPM 40 to 1200 RPM	15 to 750 RPM
FEED RANGE	.003 to .048 IPR.	.004 to .070 IPR	.004 to .070 IPR	.0025 to .100 IPR
FRONT CARRIAGE: Longitudinal feed with angular feed-in, max. Swing over cross slide, max. Rapid traverse rate	 5" 8¾" 275"	 6" 12½" 250"	 8" 15¼" 250"	 12" 17" 250"
REAR SLIDE: Max. Stroke	4"	5½"	6½"	8"
LENGTH BETWEEN CENTERS	15, 24 & 36"	24, 36, 48 & 60".	24, 36, 48 & 60"	36, 60 & 84"

FREE ADDITIONAL DATA

The complete new line of Sundstrand Automatic Lathes includes the Models 4A, 8A, 12A and 16 ranging from 3 to 75 HP. Write for complete information on these new machines today. Ask for Bulletin 721.

SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2540 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

Two grinding at once with Norton

6″ or 10″ angular wheelslide grinders

- Grind thrust surface and adjacent diameters simultaneously
- Cut production costs
- Save time, labor

Get rid of separate shoulder grinding! Grind thrust surface and adjacent diameter to fine accuracy and finish *in one automatic operation!* "One lever" cycle control on these Norton hydraulic semiautomatic cylindrical grinders helps your operator produce more work with less effort. What's more, you get concentric grain pattern in finish of thrust surface. This gives you a superior seal surface and better appearance than old-style method of grinding with side of wheel. Special features also assure ease and speed of maintenance and servicing.

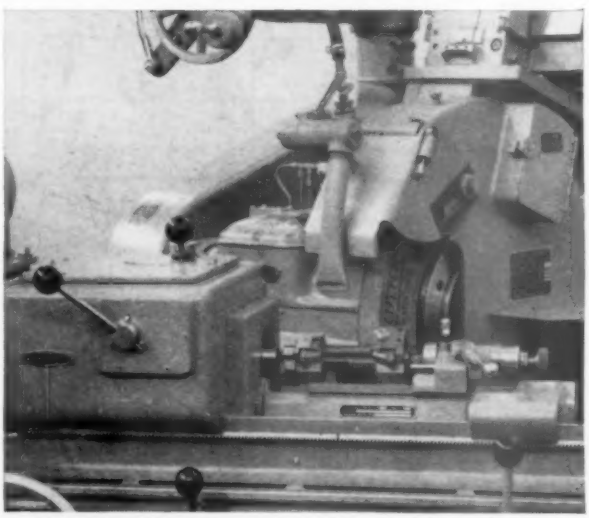
These time- and labor-saving standard Norton angular wheelslide grinders can also be adapted for *special* jobs, thanks to Norton's long experience and special Norton devices that make such adaptations possible.

Remember, too, the Norton angular wheelslide grinders are but two of many Norton machines, *representing the world's most complete line of grinders* . . . products of Norton engineering leadership.

Only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost.

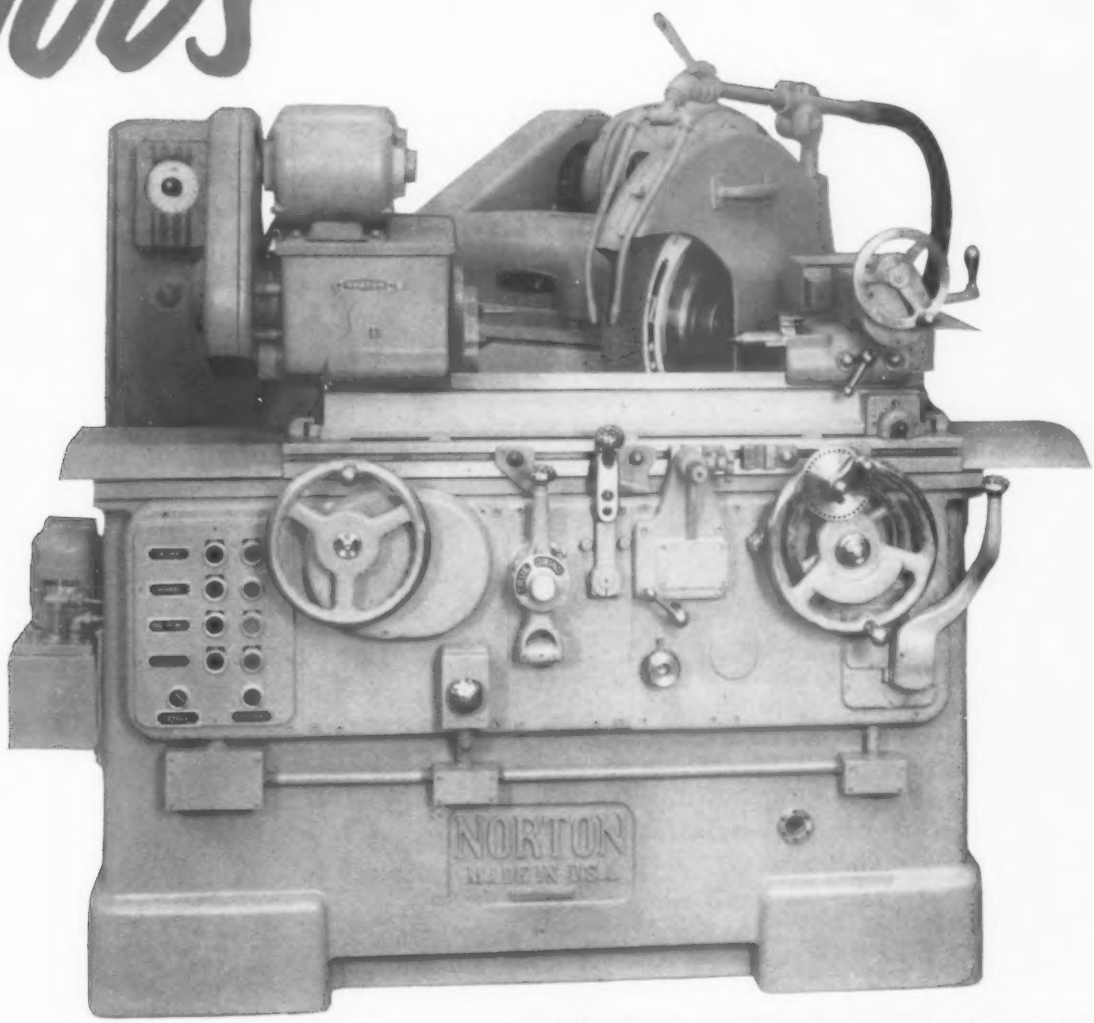
If you're planning now for "post-emergency" production, we will be happy to discuss with you your requirements in grinding machines and to fit tentative delivery schedules into your plans.

For further information on the Norton 6″ or 10″ angular wheelslide grinders ask your Norton Representative for Catalogs 1793 and 533, or write us direct. NORTON COMPANY, Machine Division, Worcester 6, Mass.

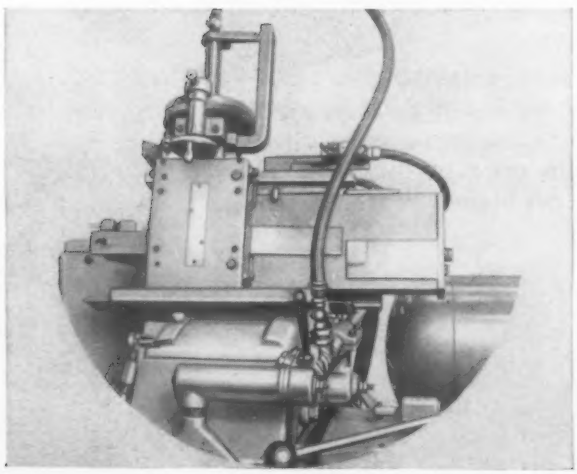


THIS NORTON CAM-O-UNIT on a 10″ angular wheelslide machine is typical of how Norton engineers can adapt standard machines to special jobs. Unit shown is grinding the radius and platform surfaces of jet engine blades.

jobs



NORTON ANGULAR WHEELSLIDE MACHINE makes one job out of two by grinding thrust surface and adjacent diameter simultaneously. Pictured above is standard 6″ angular wheelslide machine.

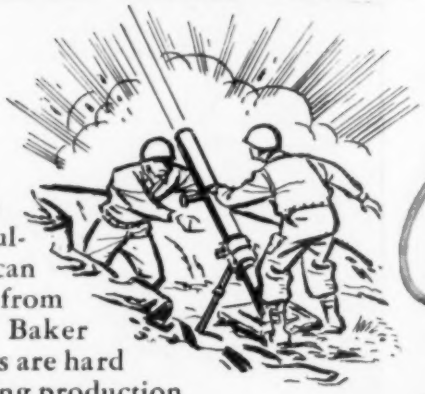


NORTON'S WHEEL GUARD TRUING DEVICE replaces hand-operated equipment, decreases effort, time, and skill needed to true wheels. It increases production, wheel life, diamond life, and is easily built into Norton angular wheelslide grinders. Operator merely pushes button when truing is needed, diamond automatically traverses both surfaces of wheel.

56 Parts per hour...

BAKER

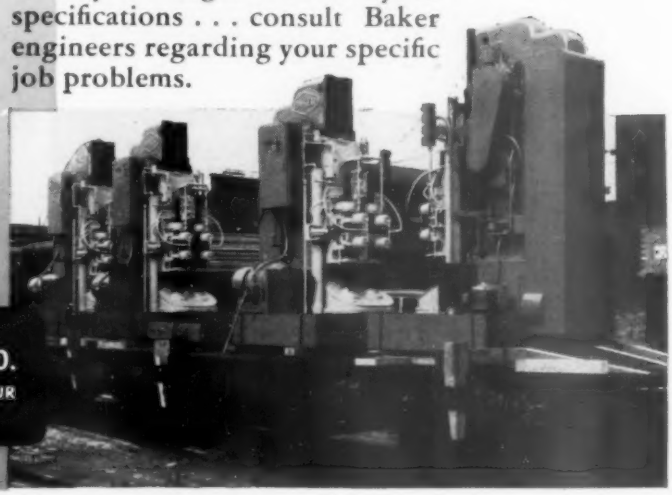
KEEPS MORTAR SHELLS ROLLING OFF THE LINE!



Better machine tools are the bulwark of American defense. Today, from coast-to-coast, Baker special machines are hard at work increasing production figures in the manufacturing plants across the nation... New Baker special machines are rolling off the line for even greater productivity, as fast as they can be designed and manufactured.

Increased production is attained in boring and counterboring operations on 4.2 inch chemical mortar shells with Baker special machines. Rate of production . . . 56 parts-per-hour. The machine . . . Baker Model 30 HO Heavy Duty Two Spindle Inverted Type Hydraulic Feed High Speed Boring Machine. The operations... chucking two shells; locating shells over spindles from fixed vee blocks, one each at upper and lower end of each shell; bore 3.73" diameter hole to 15 inch depth of cut; counterbore 3.74" diameter hole to 7/16 inch depth of cut.

Baker special machinery is designed to meet your specifications . . . consult Baker engineers regarding your specific job problems.



BAKER BROTHERS Inc., Toledo, O.

DRILLING, BORING, TAPPING, KEYSEATING AND CONTOUR GRINDING MACHINES

Starrett

FRICTION THIMBLE* MICROMETERS

Give You

- UNIFORM PRESSURE
- UNIFORM READINGS

Every Time

Starrett
"SATIN CHROME"
MICROMETER No. 231-F
With Friction Thimble
Range 0-1" by .0001",
shown above.
Friction Thimbles also available on other sizes and styles.

*An improved friction stop mechanism built right into the thimble permits easy one-hand operation of the micrometer . . . insures uniform contact pressure on every measurement. *Friction Thimble* puts the friction stop mechanism "right under your thumb" where it's easy to reach, easy to *use*. You get the same sure accuracy every time independent of "feel". *Friction Thimble* is an ideal feature for inspection and quality control applications and for all precision work requiring consistent accuracy. Ask your Starrett Tools distributor to show you Starrett Micrometers with *Friction Thimble* . . . plus 12 other big Starrett features including Satin Chrome Finish, Tapered Frame, Hardened Threads ground from the solid and stabilized and Hi-Micro Mirror-Lapped Finish on contact faces.

STARRETT TOOLS

TRADE MARK
Starrett
REG. U.S. PAT. OFF.

SINCE 1880
WORLD'S GREATEST TOOLMAKERS

THE L. S. STARRETT COMPANY · ATHOL, MASS., U.S.A.

BUY THROUGH YOUR DISTRIBUTOR

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS, BAND SAWS and BAND KNIVES

HELP YOURSELF...to TW

In the hands of the CARBORUNDUM engineer, the new "61" Port-A-Belt Grinding Attachment...on the desk, the new "T-61" Hub Wheel assembly.

Look to CARBO

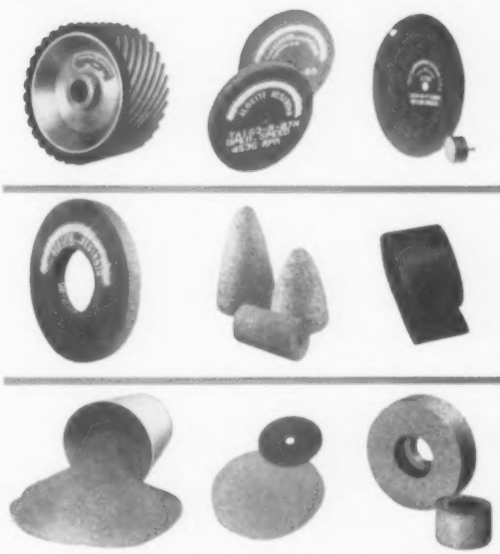
TRADE

"Carborundum" and "Port-A-Belt" are trademarks of The Carborundum Company, Niagara Falls, New York

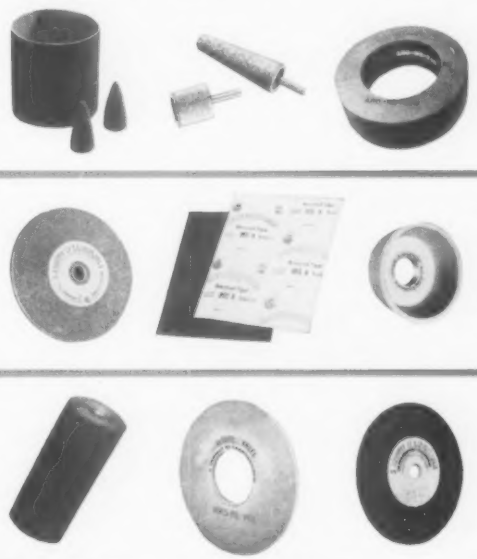
BRAND-NEW abrasive ideas!

Within the past thirty days, two entirely new concepts in grinding have been brought to you through CARBORUNDUM engineering. Backed by long months and years of design and development work, these new techniques are now ready to go to work, earning a bigger profit for you.

You can profit by both of these brand-new developments—for they have been created with just one purpose in mind . . . to cut your grinding and polishing costs to the bone. Both new products happen to apply to abrasive *belt* performance—the "61" Port-A-Belt which now makes portable belt grinding a reality—the "T-61" Hub Wheel which can cut contact wheel replacement costs in half. Next month, the headline development might be a new abrasive *wheel.* That's the tremendous and exclusive advantage you enjoy in doing business with CARBORUNDUM. Offering *all* abrasive products, we have just one axe to grind . . . yours!



Here are only a few of the 30,000 reasons why you get the RIGHT combination of abrasive and method only from CARBORUNDUM



You benefit when you call in your CARBORUNDUM or distributor salesman on any abrasive problem you have. Nowhere else can you get the unbiased counsel you have a right to expect. You'll find him listed in the yellow pages under "Abrasives." Call him today—it's to your profit!

RUNDUM

MARK

for the NEW developments in ALL abrasive products

SHEARING and FORMING a GIANT

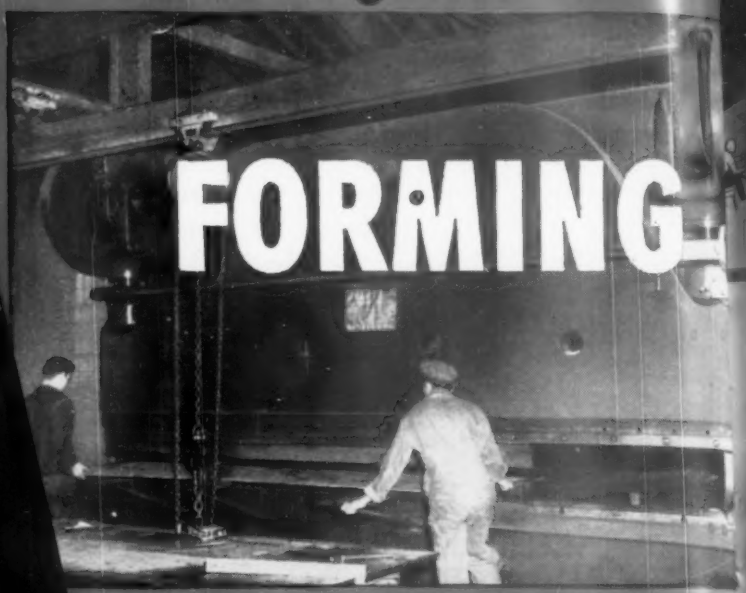
The Story of a Team

Steel sheets for these Giant Marion Shovels are formed with great accuracy on a Cincinnati 210 Series Brake. The blanks —sheared square and true on a Cincinnati 100 Series Shear—contribute to this accurate forming that speeds and simplifies assembly.

This Cincinnati Brake, with 16 feet of die surface, is forming 3/8" plate into lower frame pieces. The one inch capacity shear is cutting 3/4" plates for the shovel platform or upper deck.

Save time, save money with this dependable Cincinnati Team.

Write for Shear Catalog S-6 and Brake Catalog B-3.



The Marion 5561, World's Largest Mobile Land Product, with a 45 cubic yard shovel. Photos—Courtesy of Marion Power Shovel Co., Marion, Ohio.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

Production Pointers from GISHOLT

TIME-SAVING IDEAS

Presented as a service to machine shops, we hope some of these interesting ideas, culled from thousands of jobs, will suggest ways to help you cut time and costs in your own metal work.

HOW TO DO FAST, ACCURATE MACHINING OF MOTOR FRAMES

No. 12 Hydraulic Handles Variety of Sizes

Here is an excellent setup for machining electric motor frames in a variety of sizes ranging from 630 to 204 frames. The job is done on a No. 12 Hydraulic Automatic Lathe with both ends of the frame machined at once.

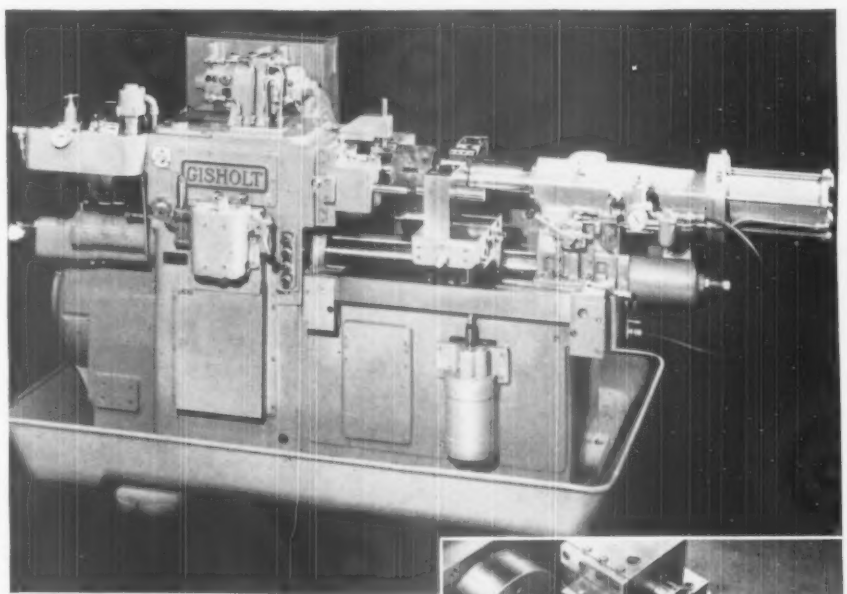
Simultaneous machining of the two rabbet fits assures a minimum and uniform air gap. It also means the end bells are concentric, parallel and in perfect alignment.

One Automatic Operation

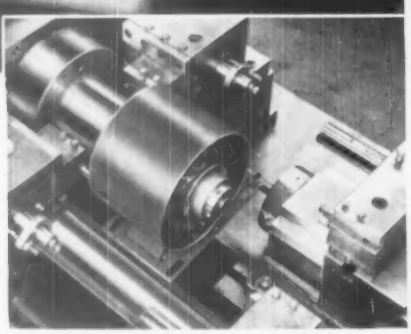
The frames come to the No. 12 Hydraulic with motor windings in place. The parts are quickly located and held by an air-operated mandrel. Tools on all four slides complete the rabbet fit and facing of both ends in one automatic operation. Floor-to-floor time on all motor frames is low, with the 204 frame (8⅜" stator) handled in only .7 minute with carbide tooling.

The job is planned for rapid changeover with tool slides having individual tool adjustments for handling the full range of frame sizes.

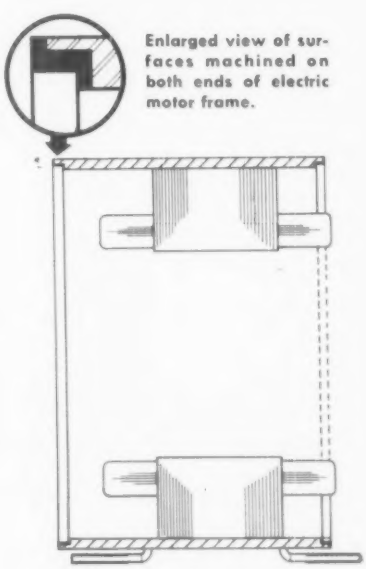
Fast, steady output of a variety of motor frames is provided by the No. 12 Hydraulic—with further savings coming from its extreme simplicity of setup, operation and maintenance.



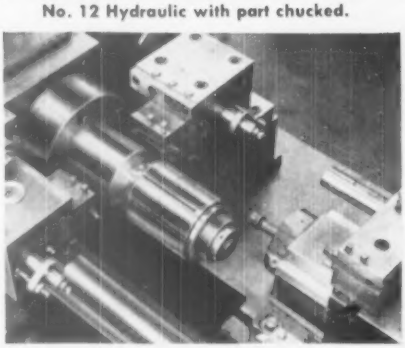
The No. 12 Hydraulic for machining electric motor frames.



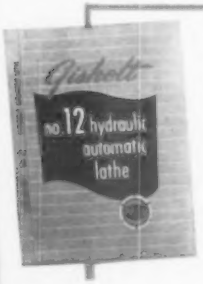
No. 12 Hydraulic with part chucked.



Enlarged view of surfaces machined on both ends of electric motor frame.



Tool setup of No. 12 Hydraulic with air-operated mandrel.



You'll get a good look at the No. 12 Hydraulic Automatic Lathe—its versatility and speed—when you have this complete new catalog. In it are full information and specifications plus photos and facts on 28 different jobs! Write for it today.

GISHOLT

TIME-SAVING IDEAS

CONTOUR BORING WITH C/F TURRET LATHE

Work Done with Special Cam Plate in Standard Taper Attachment

This 3L Saddle Type Turret Lathe is busy at top priority work in our nation's big jet engine program. The part is a turbine nozzle support, still high on the restricted list.

However, it's no secret how the cross-feeding turret and taper attachment of this turret lathe solved the problem of boring a special I.D. contour. Instead of a conventional guide plate, a special cam plate is inserted in the standard taper attachment. A cam follower on the cross feeding hexagon turret follows this guide while the stub boring bar completes the contour boring. After completing the cut, the follower can be instantly disengaged from the hexagon turret for straight turning and boring work.

There's a four-page picture story that shows how unusual turret lathe tooling and setups are producing vital turbojet engine parts. Ask for *"Turret Lathes Build Turbojets."*

Turbine nozzle support is machined from raw forging.

Setup for machining I.D. contour of jet engine turbine nozzle support. Note special cam plate in taper attachment.

Single special cam plate adapts standard turret lathe for contour boring work.

HE'S DOING IT THE RIGHT WAY

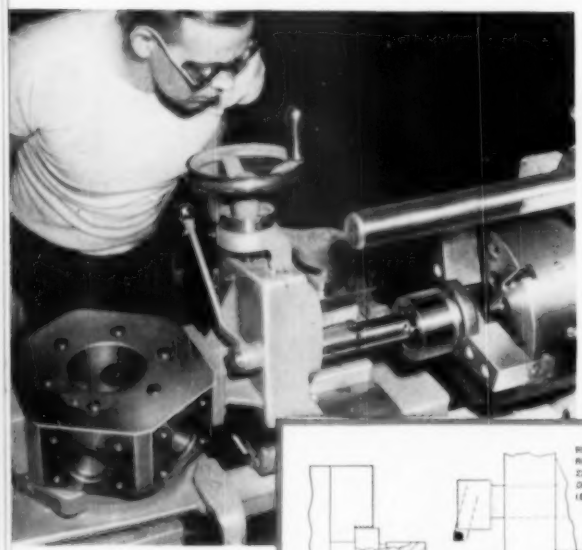
Both Turrets Working at Same Time

There's a reminder in this photo for all of us . . . and that is to watch every turret lathe job for the opportunity to do simultaneous machining from *both* turrets.

The part here is a bushing. It's machined on a No. 5 Ram Type Turret Lathe from a steel forging by well-planned but simple tooling. Rough turning, rough and finish boring and chamfering are all handled from just two faces of the hexagon turret. While this is taking place, tools on the quick-indexing square turret do finish turning, rough and finish facing and forming.

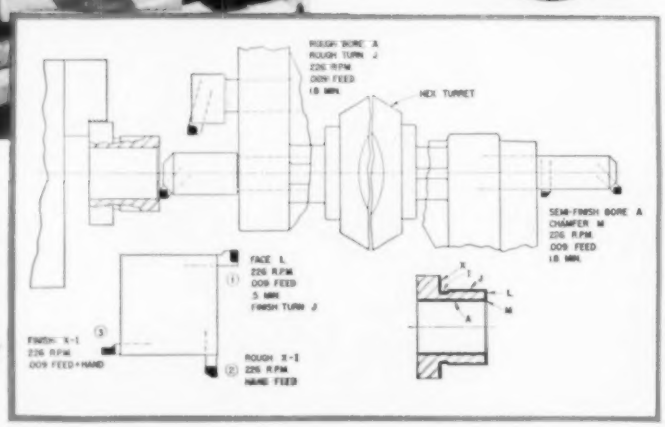
Thus, through the simultaneous use of both turrets, six surfaces are machined on this 5⅛" steel forging in only 5.4 minutes floor to floor. If only one turret were working at a time, the job would take far longer.

Simple multiple tooling on the hexagon turret, plus simultaneous machining from both turrets, means real efficiency on this job.



This close-up shows how both turrets are working at same time in machining bushing.

Steel forging and finished bushing after removal of one-third of original metal.



Tool setup for machining bushing.

GISHOLT

TIME-SAVING IDEAS

HOW TO MAKE BIG SAVING ON MEDIUM RUNS

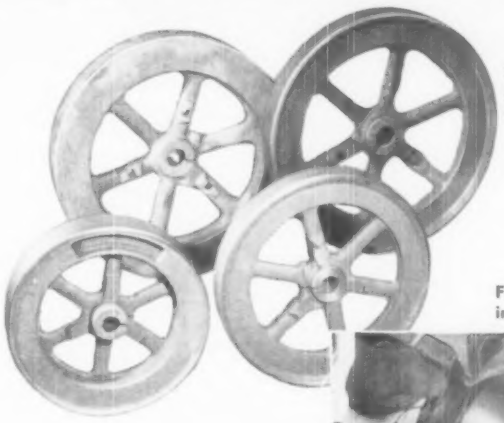
FAIRBANKS-MORSE Knows the Way—with the Fastermatic Automatic Turret Lathe

Here's another case that proves you don't need big runs to take advantage of the economies of the Fastermatic Automatic Turret Lathe. This time it's at work for Fairbanks, Morse & Co., producing a variety of flywheels in lots of 100 for their famous one-cylinder gasoline engines. The job is set up this way:

Station 1—Core drill, rough the O.D. and rough face the hub while rear cross slide straddle faces the rim. 2—Rough the bore and finish the O.D. while front cross slide finish straddle faces the rim and 1/16" radius. 3—Face the hub with turret facing attachment. 4—Finish the bore. 5—Face spokes for pulley fit with turret facing attachment. 6—Ream the bore.

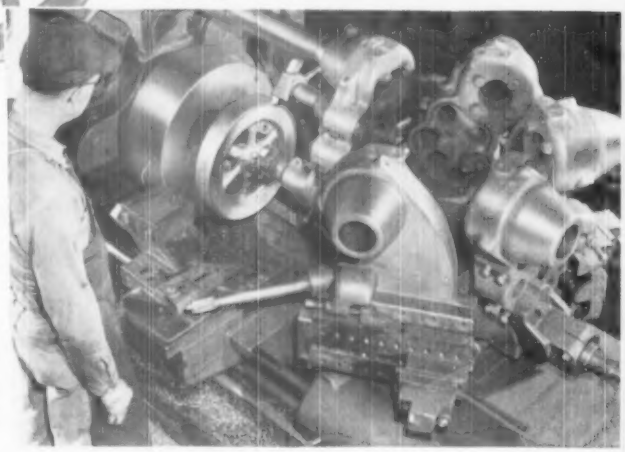
With this medium run job now handled on the Fastermatic Automatic Turret Lathe, there are no longer the delays in assembly which minor errors of hand operation caused. Man power is more productive because one operator can run two or more machines.

The faster production and greater accuracy of the Fastermatic, with one man operating two machines, make possible big savings on medium runs.



Typical flywheels machined on the one Fastermatic.

Fastermatic set up for machining cast-iron flywheels.



NINE DEEP GROOVE CUTS IN ONE OPERATION

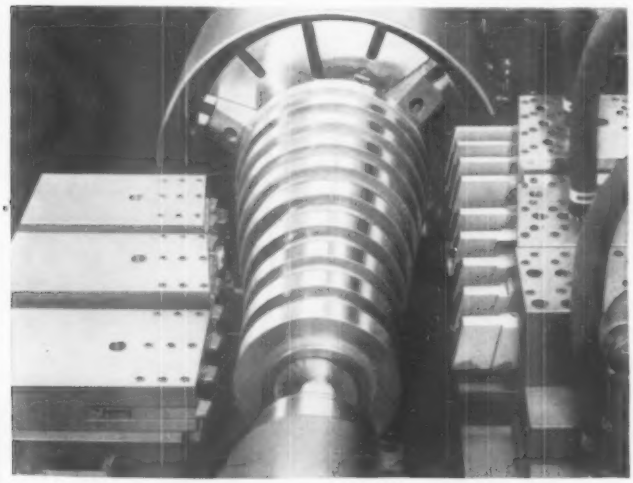
Simplimatic Automatic Lathe Simplifies the Job

The part you see here is an all-important compressor rotor for a well-known jet engine. Accuracy and high production are good reasons for giving the job to the Simplimatic Automatic Lathe.

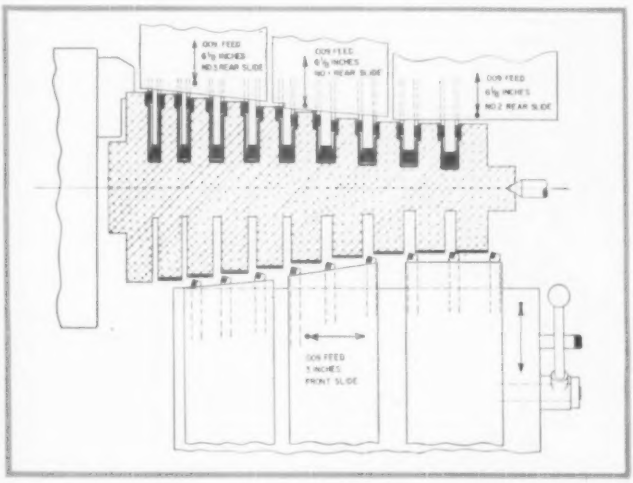
The nine grooves between the stages must be widened carefully. To do this, twenty-seven grooving tools are mounted in three rear slides. These have a common drive and are arranged so that only one slide is cleaning up at a time. This avoids excessive tool pressure.

Tools on the single front slide turn nine diameters with automatic approach, feed and return. Tools are fed laterally to machine all stage diameters except the large holding diameter. The front slide is then manually retracted to provide unloading clearance. Floor-to-floor time is an even nine minutes.

With 36 tools on front and rear slides, this Simplimatic accurately machines these difficult parts in one chucking.



Tooling on front and rear slides for machining compressor rotor.



Tool arrangement of Simplimatic for compressor rotor job.

TIME-SAVING IDEAS

NEWEST IN CRANKSHAFT BALANCING

Amazing Machine is Ultimate in Automatic Operation

Wonders never seem to cease in this important field of balancing—as proved by this special DYNETRIC Balancing Machine now on the job for a large automobile manufacturer. The machine handles V-8 crankshafts. Here's the way it operates:

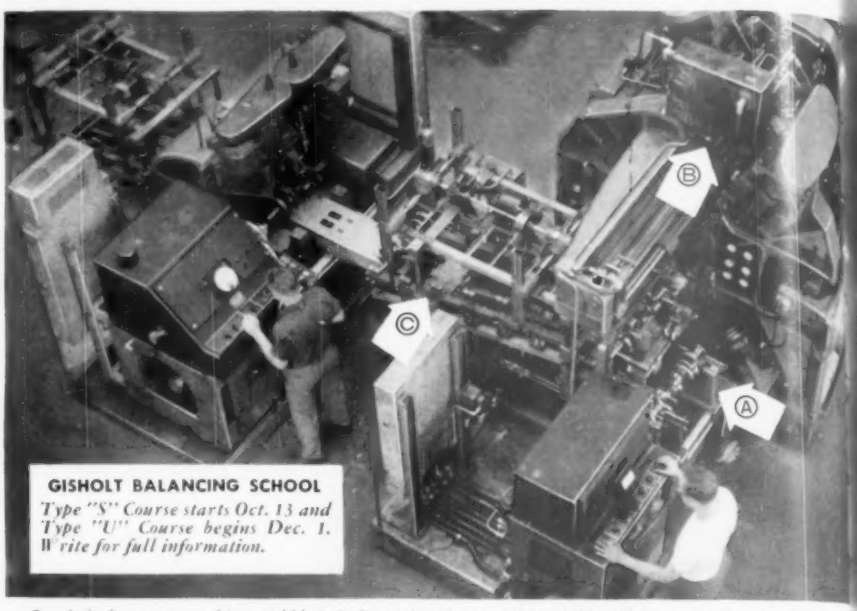
1 Crankshaft is inserted in machine, and operator measures and locates unbalance. This data is electrically transmitted to 1st correction driller.

2 Crankshaft is conveyed into driller where correction is automatically made on basis of data received from Balancing Machine. Meanwhile, unbalance in next crankshaft is being measured and located.

3 With 1st drilling completed, crankshaft is automatically carried to 2nd balancing stage. This "unloader" serves as a storehouse, holding up to 7 crankshafts as a reserve in case of line stoppage.

4 Second operator measures and locates any unbalance remaining after 1st correction and makes final corrections with small driller.

5 Crankshaft moves to 2nd "unloader" and on to assembly line for Superfinishing.



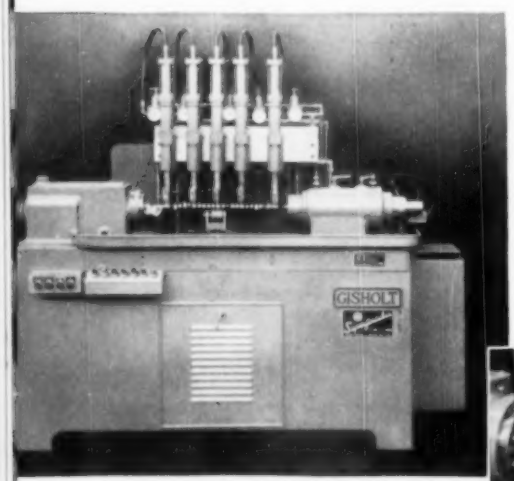
GISHOLT BALANCING SCHOOL
Type "S" Course starts Oct. 13 and Type "U" Course begins Dec. 1. Write for full information.

Crankshaft enters machine at (A), is balanced and moves into driller (B) for correction. It then travels "unloader" (C) to 2nd machine for final balancing.

Production is 40 balanced and inspected crankshafts per hour.

While this is a special machine for automotive work, Gisholt balancing equipment is adaptable for virtually all balancing problems—high production or not. Write for 6-page reprint, *"Continuous Crankshaft Balancing,"* giving the full story on this crankshaft job.

DYNETRIC BALANCERS



Model 80 Camshaft Superfinisher.

CAMSHAFT BEARING SURFACES GIVEN LONGER LIFE BY SUPERFINISHING

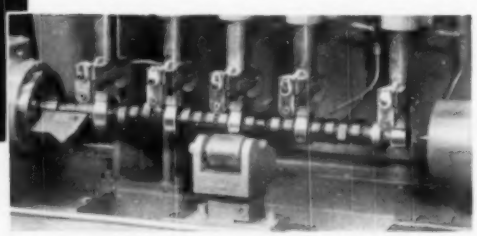
Five Surfaces Superfinished at Once at Little Cost

Here, a Model 80 Superfinisher is in the process of making life easier and longer for camshafts—through finer, smoother, longer wearing bearing surfaces.

The camshaft is loaded into the collet and supported with an air-operated tailstock. While the camshaft is rotating, the Superfinishing stones oscillate to scrub away the amorphous metal left by grinding. In 0.5 minute floor-to-floor time, this operation is complete.

These camshaft main bearings have a surface finish of 30-40 micro-inches before Superfinishing and 4-6 micro-inches after. The machine is quickly adjusted for other sizes.

The entire subject of Superfinishing is interestingly told in the book, *"Wear and Surface Finish."* Send for your free copy.



Close-up showing Superfinishing of 5 surfaces at once.

Better camshaft performance is assured with smear metal, grinder flats removed from bearing surfaces by Superfinishing.

No. 7-852
597

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

NEW Klamp-Lok Insert Holder

SPECIAL ADVANTAGES

MAXIMUM SUPPORT given insert by clamping in direction of cutting force —OPEN FACING of insert prevents chip erosion of toolholder.

QUICK ADJUSTMENT from either top or bottom gives flexibility in clamping, removing or adjusting insert.

TRIGGER ACTION spring clamp assures fast, easy insert removal—and trouble-free servicing of toolholder.

● Hundreds of plants, from coast to coast, report outstanding results with the new, improved KLAMP-LOK insert toolholder. Multiple-sided cutting edges of the TALIDE insert, turned end for end, give exceptionally long service life between grinds—and can be reground without removing toolholder from the machine setup. Equally adaptable for either conventional or inverted type of mounting, the KLAMP-LOK toolholder can cut costs on your tough, high-speed production jobs.

Solid TALIDE inserts are stocked in 9 standard sizes and 4 standard grades. KLAMP-LOK toolholders are available in 10 standard styles and 70 standard sizes.

Ask for a demonstration by our sales engineer or send today for new descriptive circular No. KL-52.

METAL CARBIDES CORPORATION
TALIDE
YOUNGSTOWN, OHIO.

METAL CARBIDES CORPORATION

YOUNGSTOWN 7, OHIO

SINTERED CARBIDES • HOT PRESSED CARBIDES
CUTTING TOOLS • DRAWING DIES • WEAR RESISTANT PARTS

OVER 25 YEARS EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

LESS THAN 1% REJECTS

by BROACH-RIFLING Gun Barrels!

Less than 1% rejects? Yes . . . considerably less, for in a lot of 17,000 barrels, 20 mm., 72" long, there were *only 5 rejects* when the rifling was done on LAPOINTE BROACHING MACHINES. Everyone can remember that just prior to World War II, when rifling was done on conventional rifling machines, the rate of necessary re-work often ran as high as 80% to 90%!

Now, in addition to the remarkable improvement in quality, there also is a significant production speed-up . . . with LAPOINTE BROACH-RIFLING. Here are some examples:

- In one plant, formerly one man ran two spindles and produced two barrels in 55 minutes. By Lapointe Broach-Rifling, the same man produced **50 per hour.** These were *finished barrels* — no reaming required, as before.
- A 20 mm. barrel was broach-rifled in **three minutes.** Former time, 4½ hours!
- A 37 mm. barrel was broach-rifled in **five minutes.** Former time, 6 hours!

LAPOINTE

Broach-rifling machines are fully described in our Bulletin HP-5.

50 YEARS IN BROACHING ! We're the oldest in the world .
1902 • GOLDEN ANNIVERSARY • 1952

BROACHING is now the accepted method of rifling. If you contemplate handling such work, it will be to your advantage to consult LAPOINTE engineers. We have had the most experience in building broaching machines, broaching tools, and fixtures.

THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

Branch Factory: Watford, Herts., England

HUDSON LAPOINTE MASS.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

"Yessir . . . every cutting tool in

THE MORSE LINE

. . . is handled by our MORSE-

He Knows How to Cut Costs for Us with MORSE ELECTROLIZED TOOLS"

Here's the quickest way to cut production costs: Order the best cutting tools you can buy . . . Morse High Speed Tools, correctly specified for the job in hand. Then specify "MORSE ELECTROLIZED" . . . and you'll get many times more the wear-life than you ever got from *any* tools on that job before . . . as scores of leading metal-working plants have done, in the last 3 years.

Get in touch today with your Morse-Franchised Distributor . . . your *only* source of supply for Morse Electrolized Tools. He has the stock and the know-how to help you start cashing in *right now,* on real savings in production costs.

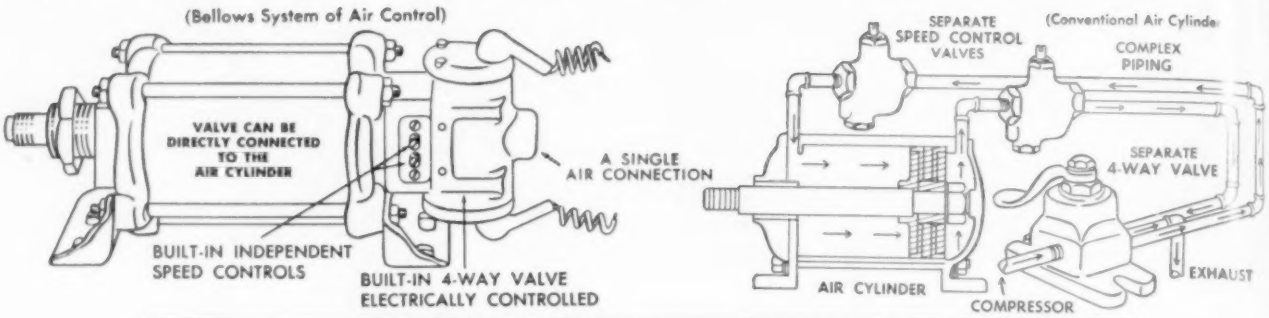
MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASS.
(Div. of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Houston, San Francisco

MORSE
Cutting Tools

. . . buy them by phone from your Morse-Franchised Distributor and save ordering time


FRANCHISED DISTRIBUTOR
MORSE
FRANCHISED
DISTRIBUTOR
MFD

Air control system designs being changed by success of low voltage solenoid "trigger"

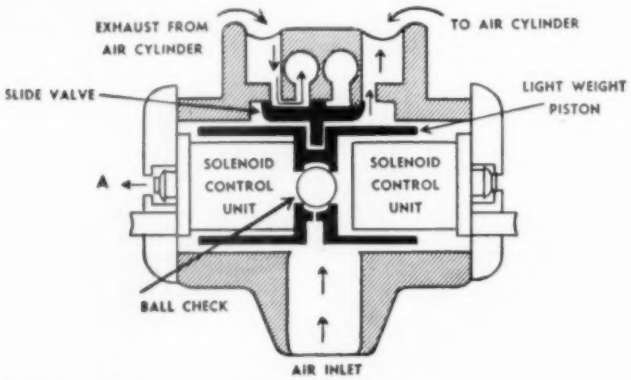


COMPARE EFFICIENT AND COMPACT BELLOWS AIR CONTROL SYSTEM WITH CONVENTIONAL METHOD

The development by The Bellows Company of a low voltage electrically controlled air valve has resulted in major design changes in equipment using air operated movements. The Bellows Electroaire valve, hardly as big as a package of king size cigarettes, does the job of power solenoid operated valves ten to twelve times its size.

The Bellows Electroaire Valve uses the air it controls to do the actual work of shifting the valve. The tiny 8-volt solenoids serve merely as "triggers" to release and direct the full force of the incoming high pressure air.

As shown in the illustration below, when high pressure air enters the valve, it fills the entire valve chest, exerting equal pressure on both ends of the small stainless steel piston. A momentary electric current sent to one of the two sealed solenoid control units draws the plunger away from the end cap for a fraction of a second, permitting high pressure air to escape to the outside. The check ball is drawn tightly against its seat. All of the incoming high pressure air on the opposite side is thus directed against one side of the small piston, shifting the valve. Energizing the opposite solenoid control unit reverses the valve.



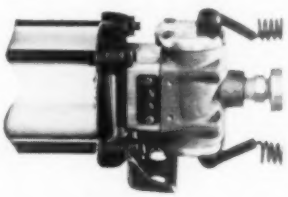
WHY THE LOW VOLTAGE?

Since the incoming air pressure does the work of shifting the valve, only a small amount of energy is required to move the solenoid plungers. 8 volts prove ample. Since the electrical contact is only momentary, and since the solenoid control units are located in the air stream, a natural coolant, heat is not a problem. In fact, the solenoid control units are guaranteed against burnout.

The low voltage simplifies wiring, does away with the necessity of expensive and bulky conduit, terminal blocks, and relays; and low voltage provides assured electrical safety for operator and machine.

BUILT IN SPEED CONTROLS MAKE THE ELECTROAIRE VALVE A COMPLETE "PACKAGED" AIR CONTROL UNIT

In conventional air cylinder practice, control of piston rod speed can only be obtained by inserting separate speed control valves in the air lines leading from the two cylinder ports to the remote air control valve. In the Electroaire valve two independent speed control regulators are built right into the valve itself, thus not only eliminating the extra valves but the extra piping as well. The Electroaire Valve is fast — will operate at speeds in excess of 2000 movements a minute, far beyond the capacity of any air cylinder with which it may be used.



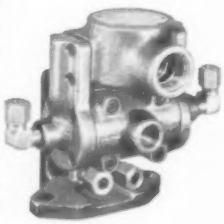
STANDARD AS A BUILT-IN FEATURE ON ALL BELLOWS BEM AIR MOTORS OR AS A SEPARATE AIR CONTROL FOR ALL MAKES OF STANDARD AIR CYLINDERS

The Electroaire Valve is standard equipment on all Bellows Air Motors and other Bellows "Controlled-Air-Power" Devices arranged for electrical control. It is also available with an adapter mounting bracket for use with any standard air cylinder of suitable capacity. Three port sizes, ¼", ⅜" and ½" cover air cylinder bores from 1" to 4½".

PROVED IN OVER 60,000 INSTALLATIONS

More than 100,000 Electroaire Valves are now in use in more than 60,000 separate installations. Many Electroaire valves have established operating records of twenty to thirty million cycles without maintenance of any kind.

"EXPLOSION-PROOF" MODELS PERMIT SAFE USE OF ELECTRICALLY-CONTROLLED AIR POWER IN HAZARDOUS LOCATIONS



The "explosion-proof" Model of the Electroaire Valve meets fully requirements of the National Wiring Code of The National Board of Fire Underwriters for wiring in hazardous locations. All electrical connections are fully enclosed in a sealed cast bronze housing.

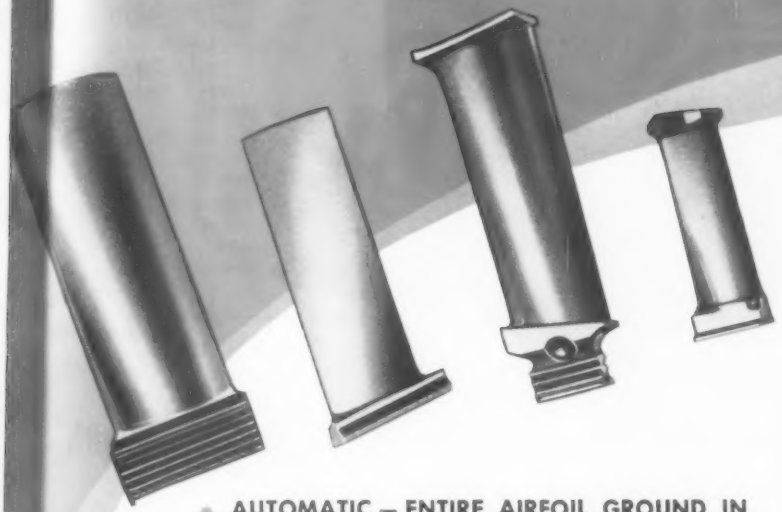
MAY WE SEND YOU THIS GROUP OF CASE HISTORIES

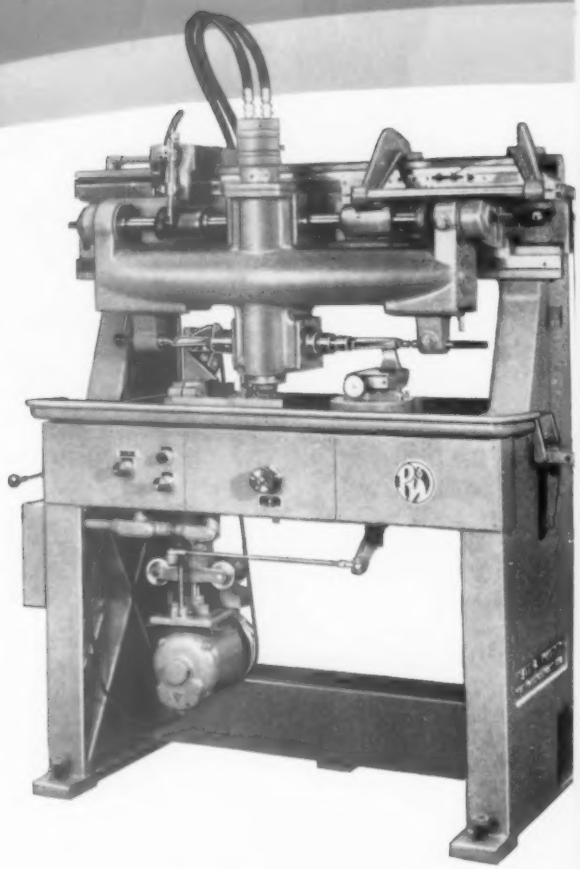
showing typical installations of The Bellows Electroaire Valve? Photographs, wiring diagrams, cost and production data. Free on request. Write Dept. TE 752, The Bellows Co., Akron 9, Ohio.

The Bellows Co.

AKRON 9, OHIO

SPEED UP JET BLADE PRODUCTION *Automatically* WITH PRATT & WHITNEY TURBINE BLADE AIRFOIL GRINDERS





- AUTOMATIC — ENTIRE AIRFOIL GROUND IN ONE OPERATION, INCLUDING LEADING AND TRAILING EDGES
- GRINDS *ALL* IRREGULAR AND TWISTED AIRFOIL SECTIONS
- ACCURACY HELD TO ± .003"
- EASY TO OPERATE — ONE LOADER CAN SERVE BATTERY OF GRINDERS
- EACH BLADE A GOOD BLADE — UNIFORMLY ACCURATE
- MINIMUM SCRAP LOSS AND INSPECTION COST

Here is a solution to the demand for more and more jet blades. The P&W Turbine Blade Airfoil Grinder is the ultimate for exactly reproducing dimensions and shape from a master. Any forged or fabricated jet engine blade up to 9" x 4", having <u>any</u> irregular and twisted airfoil section, is precision ground in a single automatic cycle.

This newly-developed machine, utilizing the advantages of a high-speed coated abrasive belt, provides industry with a precision production blade grinder — <u>not</u> a polisher — that insures lowest cost per blade.

The P&W Grinder features an exclusive 5-cam system that controls the shape, angle of the grinding contact, variation of work rotation speed, compound motion for grinding to angular blade roots, number of passes and amount of stock removed . . . plus speedy loading.

The complete airfoil section — including the important leading and trailing edges — is finished and smoothly faired regardless of the angle of the blade root. Close and consistently uniform tolerances are maintained.

PRATT & WHITNEY
DIVISION NILES-BEMENT-POND COMPANY
WEST HARTFORD 1, CONNECTICUT, U. S. A.

First Choice P&W *for Accuracy*

PRATT & WHITNEY — Div. Niles-Bement-Pond Co.
16 Charter Oak Blvd., West Hartford 1, Conn.

Gentlemen:
PLEASE MAIL ME COPY OF YOUR TURBINE BLADE AIRFOIL GRINDER FOLDER

NAME_____

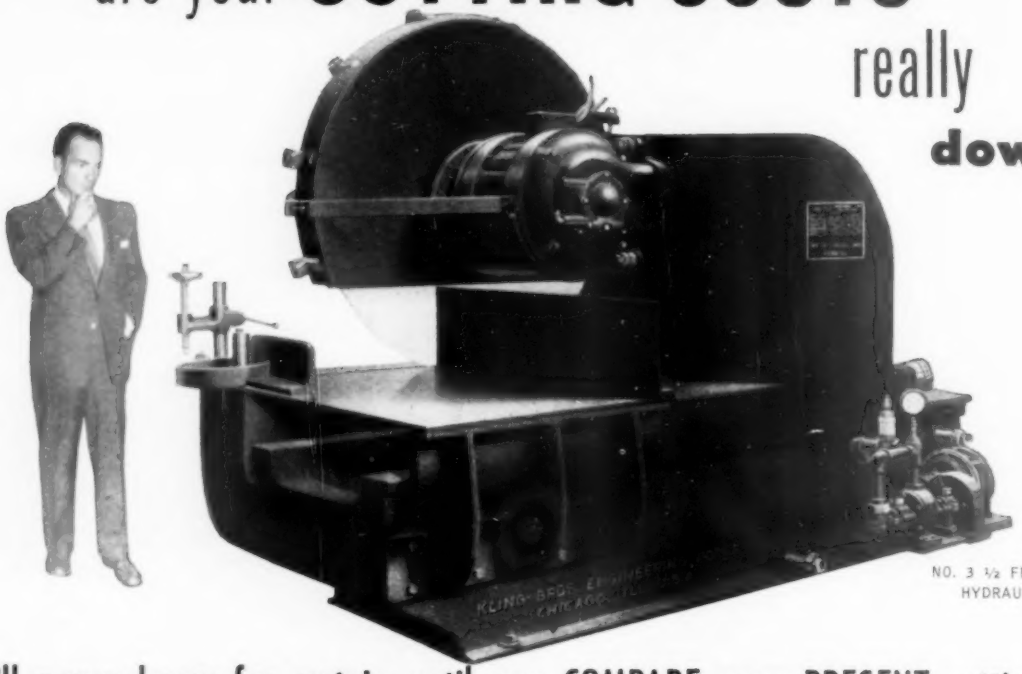
POSITION_____

COMPANY_____

CO. ADDRESS_____

CITY_____ ZONE_____ STATE_____

are your CUTTING COSTS really down far enough ?



NO. 3 ½ FRICTION SAW
HYDRAULIC FEED

you'll never know for certain until you COMPARE your PRESENT cutting speed with

the faster Kling HIGH SPEED FRICTION SAW!

What is friction sawing?

It's a proven method of cutting metal by generating heat through friction on the part to be cut at a rate faster than that part can absorb heat. This temperature increase reduces the tensile strength of the piece to the point that the weakened surface can no longer resist the action of the colder blade. The metal is thus easily removed with no apparent wear on the blade surface.

Fastest, all-around cut-off machine in the shop!

Cuts all types of steel, hard or soft, big or small, in any shape, without distortion. For day-in, day-out production, one Kling Friction Saw will do the volume of work that would ordinarily require several separate shears or slow speed saws. One of the big time-saving reasons is the ability of the Kling Friction Saw to cut any structural shape, without change of blade or setup. Because the average Friction Saw blade will give a good full day's production before requiring redressing, you eliminate costly downtime and also save on tool costs.

FREE complete, friction sawing information!

Learn how you can profitably apply Kling Friction Sawing in your plant. The information contained in this 12-page bulletin will give you the complete story on Friction Sawing . . . including the principles of the process and some of its applications. Write today for your FREE copy.

KLING BROS. ENGINEERING WORKS
1321 N. Kostner Ave. • Chicago 51, Illinois

How long would it take you to cut these pieces?		With a Kling friction saw you could do it in approximately . . .
24" 100 lb. I Beam	⊢⊣	28 seconds
15" 55 lb. Channel	⊏	15 seconds
8"x8"x34.3 lb. H Beam	H	10 seconds
100 lb. A.R.A. Rail	I	9 seconds
6-1/2"x6-1/2"x19.8 lb. Tee	T	5 seconds
8"x8"x3/4" Angle	∧	11 seconds
3" Square	■	10 seconds
4" Round	●	15 seconds
6" O.D. Tube, 1/2" Wall	○	11 seconds

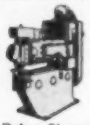
60nn

*What's your requirement? There's a size to fit your specific needs—large or small.

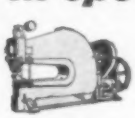
Kling ...an investment in speed!

Combination Shear Punch & Copers

Double Angle Shears



Rotary Shears



Punches

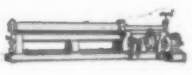


Plate Bending Rolls

The Tool Engineer

Editorial

The Responsibility of Leadership

We have, during the past few months, shown that the potential advantages of a technical society are best realized by the individual member when he participates actively in the work of that organization.

The basic structure of ASTE is established not only to encourage participation by members of the Society, but in addition to encourage members to play as large a part as possible in the direction and leadership of the chapter and the national organization. Appointments as committee members or chairmen, election to local and national offices all represent a segment of Society leadership.

As in industry, a member able to serve and appointed to a position of potential leadership has a responsibility to his associates, fellow officers and to the members whom he has agreed to serve.

These responsibilities vary in nature but not necessarily in importance. Each responsibility is similar to a link in the fabled chain, and the organization, whether it is local or national, functions only as well as the performance of its components.

Members of the program committee, local or national, hold one of the strongest influences in encouraging potential ASTE members and holding the enthusiasm of present members. Public relations and editorial committees have an obligation to the local or national unit they serve. Members of these and other committees have the responsibility of contribution; chairmen have the responsibility of selecting qualified men to serve, then encouraging their contributions.

Officers, local or national, have the responsibility of management. Through committees they delegate specific responsibilities, but theirs is the responsibility of ensuring capable ideas, and follow-up to ensure progress.

Leadershp demands responsibility, and successful leadership demands recognition of responsibility and the will to carry it out.

L. B. Bellamy

PRESIDENT
1952-1953

rry E. Conrad
Executive Secretary
lan Ray Putnam
Assistant Executive Secretary

Editorial

Gilbert P. Muir
Editor
Robert T. Kimmel
Associate Editor
Nancy L. Morgan
A.S.T.E. News Editor
Robert Steiger
Art Editor
Dorothy J. Taylor
Assistant Editor

Business

Allan Ray Putnam
Business Manager
Clarence T. Etter
Advertising Manager
10700 Puritan Ave.
Detroit 21,
Michigan
Austin G. Cragg
Eastern Advertising Manager
400 Madison Avenue
New York 17,
New York
Richard E. Cleary
Ohio Advertising Manager
Commercial Bank Building
Berea, Ohio
Stanley F. Girard
Western Advertising Manager
540 North Michigan Avenue
Chicago 11, Illinois
W. R. McIntyre
Pacific Coast Advertising Representative
423 First Trust Building
Pasadena 1, California
Michael Jakesy
Production Manager
Fay H. LaRoue
Circulation Manager

THE TOOL ENGINEER
Publication of The American Society of Tool Engineers
10700 Puritan Ave.
Detroit 21, Mich.

The Tool Engineer

a letter from the Editor

A recent article in THE TOOL ENGINEER, outlining a suggested organization for progressive tool engineering, proposed the assignment of a substantial share of product engineering to the tool engineering department. The thinking behind this aim was to effect a close liaison between the design of the product and the tooling for its production.

Experienced tool engineers recognize that there must be a considerable degree of cooperation between designers and tool engineers in order to come up with the ideal compromise: a design which has sales appeal, is functional (does the job for which it is intended), and represents the lowest possible tooling and manufacturing cost consistent with the first two items.

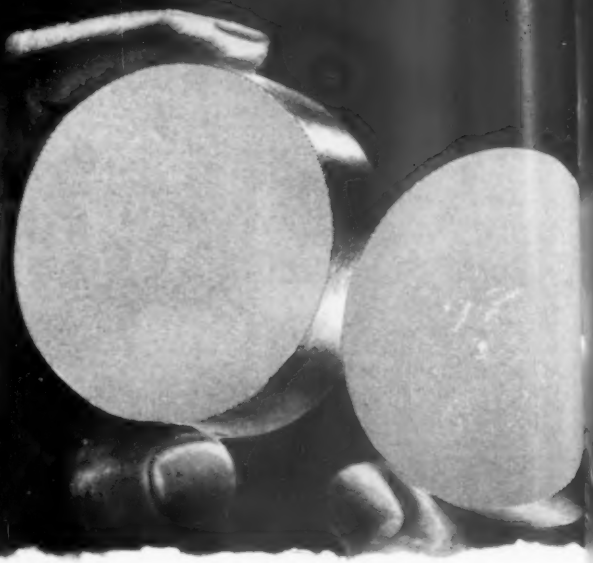
Such a compromise is effected in a number of ways. Quite often the completed design is turned over to tool engineers for estimates, models and perhaps a pilot line. This means, in practice, that one complete engineering job is finished, the project turned over to another department for a second complete operation, and then a series of back-and-forth studies to develop our compromise.

We believe that the tool engineer will never replace the product designer, nor vice-versa. But quite a bit of the work of one influences and can commit the other. And there is a substantial area between the two which is in some respects a no-man's land, in others a supplementary and even overlapping area.

Obviously a function of this importance and with these characteristics bears streamlining. The liaison referred to above has performed successfully in several plants where it has been installed. There are others, in varying degree of interdepartmental association, which work equally well under certain circumstances. We'd appreciate your comments on your own experiences.

Gilbert P. Muir

the naked eye tells you why...



"DESEGATIZED" HI CARBON-HI CHROMIU

die steels are the BEST

Compare the actual photographs (above) of random-cut hardene polished and etched samples—"DESEGATIZED" Steel on the left; t average standard process steel on the right. Note the full uniform of the "DESEGATIZED" steel—no harmful carbide concentrations a present!

This means that when you specify "DESEGATIZED" Hi Carbon–H Chromium Die steels, you get

- ease of die machining
- minimum heat treating hazard
- extra toughness
- superior die performance

Production economy demands the best die performance! Select the be steel for your next die job—one of the "DESEGATIZED" Hi Carbo Hi Chromium die steels!

See the difference with your naked eye—take advantage of anoth Latrobe service—Inspection Discs cut from the bars making up your n order for "DESEGATIZED" High Carbon-High Chromium Die Steels.

SEND FOR THIS BOOKLET TODAY!

LATROBE STEEL CO.
Latrobe, Pa.

Yes! I am interested in your Metallurgical Inspection Disc Service. Send booklet at once.

NAME .....

POSITION .....

COMPANY .....

STREET .....

CITY ..... ZONE .....

LATROBE STEEL CO.

Formerly LATROBE ELECTRIC STEEL CO.

LATROBE, PA.

Branch Offices and Warehouses: BOSTON, BUFFALO, CHICAGO, CLEVELAND, DAYTON, DETROIT, HARTFORD, LOS ANGELES, MILWAUKEE, NEW YORK, PHILADELPHIA, PITTSBURGH, ST. LOUIS, TOLEDO.

Sales Agents: DALLAS, DENVER, HOUSTON, MINNEAPOLIS, SALT LAKE CITY, SEATTLE, WICHITA.

Metal Cutting Temperatures and Tool Wear

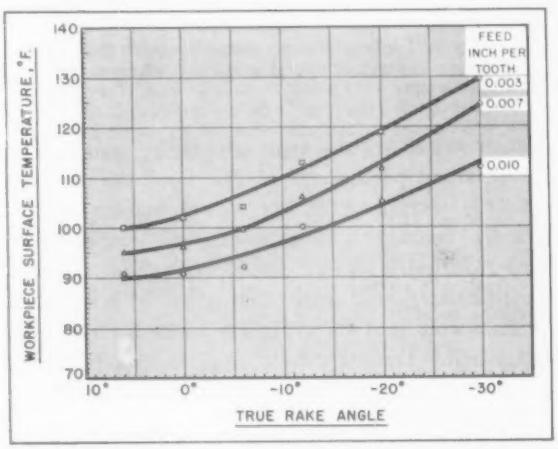
Part I

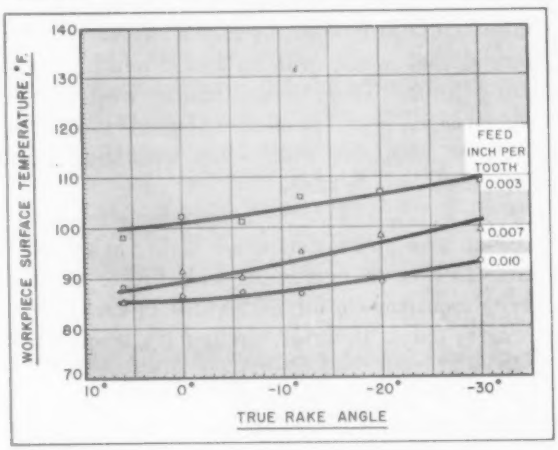
By A. O. Schmidt
RESEARCH ENGINEER
KEARNEY & TRECKER CORPORATION

THE STATEMENT "and the workpiece was cold after the cut" appears quite frequently in magazine articles describing steel milling operations performed at comparatively fast cutting speeds and usually with cutters having negative rake angles. This seems quite true to the casual observer since a workpiece of comparatively large proportion, even one of steel, does feel cool to the touch immediately after cuts taken at the faster cutting speeds. It is also commonly known that workpieces machined at slower cutting speeds heat up considerably more.

When measuring the surface temperatures of SAE 1055 workpieces of equal dimensions after being milled at 106 fpm cutting speed, it was found that feed and radial rake angles (true rake angles) would influence these values as shown in Fig. 1. The surface temperatures would increase with larger negative rake angles and with finer feeds. The surface finish as measured with a profilometer on these workpieces machined at 106 fpm was around 200 microinches for a feed of 0.010 in. per tooth and 120 microinches for a finer feed of 0.003 in. per tooth. In Fig. 2 the same tendency can be observed when cutting under similar conditions at a faster cutting speed of 1180 fpm, but the overall temperature values are generally lower (1*). The surface finish was about 15 microinches for a feed of 0.010 in. per tooth and about 10 microinches for a feed of 0.003 in. per tooth. Thermal measurements with a calorimeter indicated that the average chip temperature would also increase with a finer feed or

*Numbers in parentheses refer to the bibliography at the end of the paper.





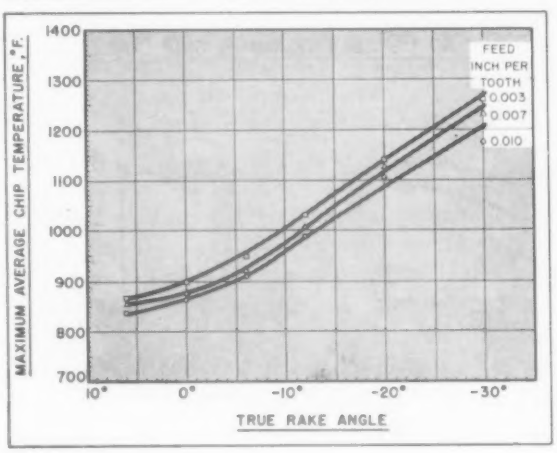


Fig. 1. (top) Surface temperature of workpiece measured with thermocouple immediately after milling at a cutting speed of 106 fpm; room temperature, 70 deg F; material cut, SAE 1055; depth of cut, 0.125 in.

Fig. 2. (center) Surface temperature of workpiece measured with thermocouple immediately after milling at a cutting speed of 1185 fpm; room temperature, 70 deg F; material cut, SAE 1055; depth of cut, 0.125 in.

Fig. 3. (bottom) Average temperature of chips for cuts identical to those plotted in Fig. 2.

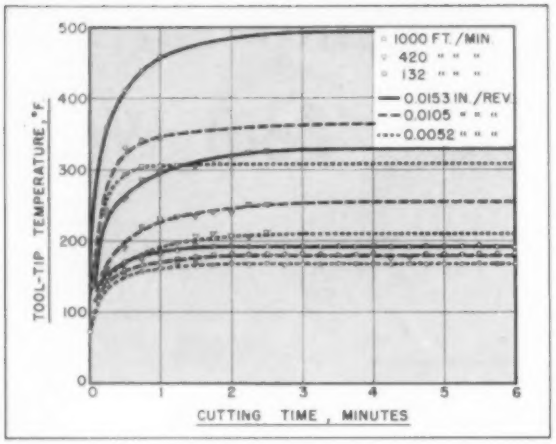


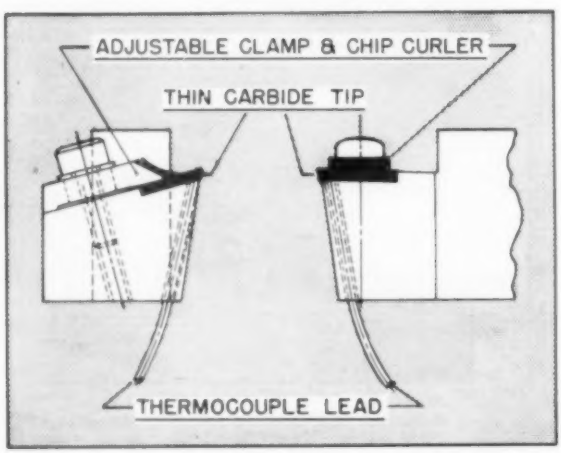
Fig. 4. Tool-tip temperatures as influenced by changes in cutting speed and feed when turning magnesium.

greater negative rake angle as can be seen in Fig. 3. A larger percentage of the total energy goes into the workpiece at the slower cutting speeds, thereby causing higher workpiece temperatures. Since, during a slower cutting operation, more of the heat developed in the formation of a chip can be conducted into the workpiece away from the material being formed into a chip, the temperatures of the chips, therefore, will be lower at slower cutting speeds (2).

The above statements are true as long as tool wear has not progressed to such a degree that the changed tool shape will influence values of the cutting forces. There is continuous wear at the cutting edge, more pronounced when machining steel, but occurring even when machining light alloys with carbide tools.

In Figs. 1, 2 and 3, the temperatures for workpiece surfaces and for chips are higher at the finer feeds. This is in agreement with higher specific energy requirements for finer chips in comparison to coarse chips. However, the tool-tip temperature

Fig. 5. Thermocouple arrangement in single-point tool; used in tests of Fig. 4.



is generally affected in just the opposite way by the chip thickness; the heavier the cut the higher the tool-tip temperatures. This has been verified by several investigators using the Herbert-Gottwein thermocouple method in which the workpiece and tool form a thermocouple which permits a determination of the tool-chip interface temperature. In discussing thermal conditions in metal cutting, Shaw (3) mentions that the tool-work thermocouple method was first utilized by H. Short at M.I.T. in 1923 to measure surface temperatures, and also points out that under certain conditions there is apparently a direct relation between tool life and tool-chip interface temperatures.

Tool-tip temperatures when turning magnesium alloy at various speeds and feeds are shown in Fig. 4. These comparative temperatures were measured with a thermocouple positioned as near as was practical to the cutting edge and beneath the 0.060-in. thick mechanically-held carbide insert which served as the tool tip, as shown in Fig. 5. The thermocouple was calibrated for temperatures on top of the carbide tip. The tool-tip temperatures in Fig. 4 confirm that these temperatures increase with the cutting speed and time of cutting. After a few minutes a state of equilibrium is reached, in most cases, which persists until the cutting edge is changed by wear.

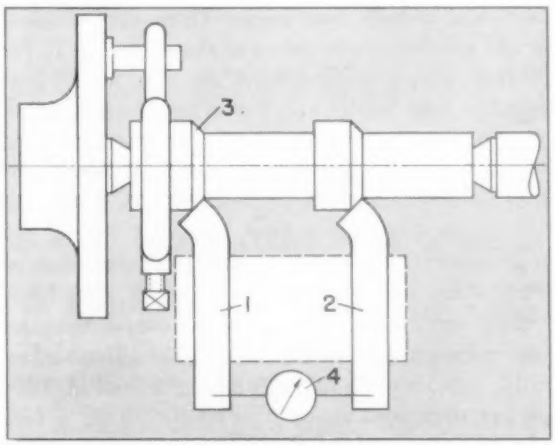


Fig. 6. Schematic view of two-tool thermocouple "Thermoduo." After Reichel. 1 and 2, tools (carbide and HSS); 3, workpiece; 4, potentiometer.

Magnesium alloys, however, cause very little tool wear in comparison to other materials and during these tool temperature tests no changes occurred in the surfaces and angles of the tool tip. Although both the specific energy (horsepower per cubic in. per min.) and the average temperature of fine chips are higher than those for coarse chips, tool-tip temperatures are lower for finer chips because of less power consumption, i.e., smaller forces.

In comparing these tool-tip temperature values in Fig. 4 with those obtained for cutting mild steel

under similar conditions, it was found that the temperature values for mild steel were about five times higher. A corresponding relationship could be established for the horsepower requirements when machining these materials.

Tool-work thermocouples register an average temperature value of the various temperature zones in the regions near the cutting edge. That isothermal zones exist in the tool tip was pointed out by Reichel (4) when he measured the temperatures in the tool tip while taking temperature measurements of the tool-chip interface with a Herbert-Gottwein thermocouple set-up. The registered tool-chip interface temperatures were checked with the actual temperatures in the tool tip, the side of which was silver-coated to eliminate oxide formation. An additional thermo-element was thus formed using a point made of the workpiece material as part of the

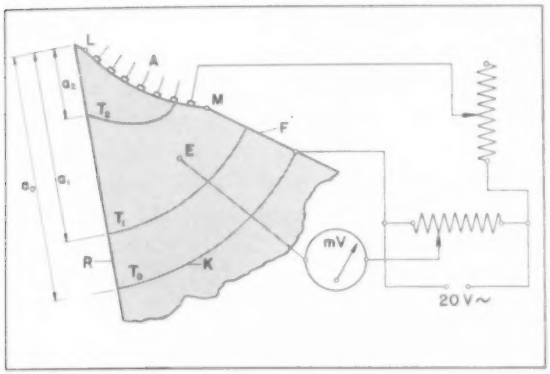


Fig. 7. Diagram of electrolytical set-up for the determination of temperature at cutting edge. After Bickel and Widmer. *F*—top face; *R*—end relief surface; *L-M*—cratering or contact surface of chip; *A*—contacts for anode; *E*—electrode for scanning field potential; *K*— arc of cathode; a_0—distance of arc of cathode from tool point; T_1—isotherm 1; a_1—distance of isotherm 1 from tool point; T_2—isotherm 2; a_2—distance of isotherm 2 from tool point.

thermo-element which touched the silvered side of the tool while it was cutting. Reichel found that the maximum tool-tip temperature was almost identical with the tool-chip interface temperature. He stated that it is the maximum tool-tip temperature which primarily causes breakdown of the cutting edge. To measure the tool-tip temperature with greater accuracy, he developed a machinability tester, known as the Thermoduo, the principle of which is shown in Fig. 6. By using two tools of different material, e.g. HSS and carbide, but maintaining the same angles and dimensions and cutting the workpiece with identical feed, speed and depth of cut, about equal quantities of heat occur at each tool point during the cutting process. This two-tool thermocouple eliminates variations of tool temperatures due to the temperature difference in tool and workpiece. Since the temperature is practically the

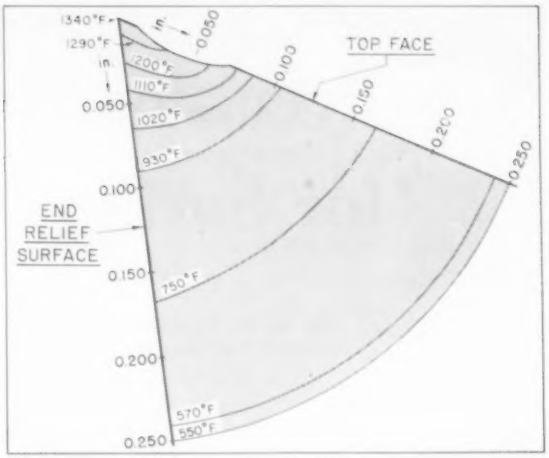


Fig. 8. Temperature distribution in single-point tool after 18 min. of cutting. Determined by Bickel and Widmer through electrolytical analogy. Cutting speed 116 fpm; feed 0.020 in.; depth of cut 0.200 in.; material cut, steel 0.35C; tool, HSS + 5 percent Co.

same at both tools, the influence of the workpiece material upon the voltage is also eliminated. The voltage measured is thus determined by the thermoelectric properties of the tool bits. These tool-tip readings are used as a machinability index.

To check tool-tip temperatures, as obtained by temperature indicating colors, Pahlitzsch and Helmerdig applied the graphical method of E. Schmidt (5) modified for the solution of the complex problem of heat transmission in a tool tip (6). They came to the conclusion that their temperature-indicating colors have only a limited use in this case because values obtained are not an indication of the maximum temperature at the cutting edge. Since the cutting edge itself is surrounded by air of high temperature because of limited circulation, the thermocolors used would really indicate the temperature of the heated gas and not the temperature of the color carrier, i.e., the tool tip.

Further experiments conducted by Bickel and Widmer with Tempilac thermocolors ascertained various temperature zones near the cutting edge. The values thus obtained were used in an electrolytic model of the tool tip (7). Voltage at various points was regulated according to the temperatures established with thermocolors. See Fig. 7. The potential of the electrolytic bath was then determined in various places and this permitted the computation of the proportionate temperatures as indicated in Fig. 8. The maximum temperature at the cutting tip was 1340 deg F in comparison to 1040 deg F which had been found with the tool-work thermocouple measuring the tool-chip interface temperature when turning 0.35 percent C steel with a HSS tool at 118 fpm cutting speed, 0.200-in. depth of cut and 0.020 ipr feed.

(Continued next month)

New Precision Reference Specimens for Surface Finish Control

By C. R. Lewis
CHRYSLER CORPORATION

and

A. F. Underwood
GENERAL MOTORS CORPORATION

THE QUALITY of the surfaces used on load carrying and wearing elements of machines has long been recognized as an important factor in machine performance and durability. As manufacturing methods improve, particularly the ability to reproduce similar surfaces in quantity, an increasing need is felt for methods of specification and control of surface finish. About fifteen years ago a number of manufacturers became interested in this subject. It was discovered that the best way of controlling surface finish was by specifying the average surface roughness. Such a specification could be expressed as a single number which in most cases gave excellent correlation with service performance of the surface. As a result of this work, several instruments for measuring surface roughness were developed, and a number of industrial plants set up surface finish standards for control of their own products.

During the war, military procurement policies led to the interchangeable manufacture of parts by several manufacturers, and when subcontracting of manufactured parts was widely practiced, it was found that the existing system of surface finish control was inadequate for such conditions. The independently set up company standards seldom agreed with each other, and the precision and reproducibility of measuring instruments, especially those made by different manufacturers, was not sufficient to insure the necessary control.

The art of surface finish control was in this state immediately after the war when technical representatives of General Motors and Chrysler, each of whom had been previously interested in the field, decided that an improved standardization procedure for surface finishes was needed, and that such a procedure could best be developed by a joint project supported by both corporations. The proposed method of standardization called for the production and distribution of accurate and reproducible physical standards of surface roughness which would perform much the same function for roughness measurements as the Johanssen gage blocks did for dimensional control. The production of these precision surface finish specimens has required seven years of continuous effort to obtain the necessary accuracy and uniformity. The project has been successfully carried on to the point where standard surface specimens are now available commercially covering the range of most commonly encountered surface roughness.

The design chosen for these precision surface finish specimens is such as to facilitate the use of presently available instruments for measuring surface roughness. The surface profile finally adopted after some experimentation is shown in Fig. 1. It consists of a series of planes inclined to each other at an angle of 150 degress. The height of the profile is made at a series of definite values corresponding to the preferred roughness values adopted by the American Standards Association. The spacing is fixed by the profile height and the angle, and increases in direct proportion to the roughness. The

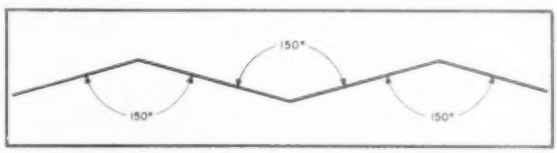


Fig. 1. Surface profile of precision reference specimens.

geometry of such a surface is simple and lends itself readily to a calculation of various types of specified average surface roughness which have been proposed or are in use. The spacing is such that no measurement errors are involved due to wave length limitations of any roughness measuring instrument now available. The wide groove angle allows deep penetration of stylii commonly used in measuring instruments. It was found after the initial surfaces

Presented at the Twentieth Annual Meeting of American Society of Tool Engineers, March, 1952.

of this type were produced that their appearance did not resemble that of any commonly used surface and that it was difficult to judge the roughness of the standard specimens by either appearance or feel.

At the beginning of this project plans were made to produce a series of 18 surfaces ranging in roughness from five microinches average deviation from the mean to 500 microinches. Of these 18 projected specimens, approximately half have been made. At the present time only five roughness values are available commercially, covering a roughness range from 20 to 125 microinches. These specimens are used for the calibration of surface roughness measuring instruments. Their use will enable roughness measurements, taken at any time or place, to be compared directly with measurements taken at any other time or place.

The production of these specimens involved a solution of numerous unexpected problems. The first work done on the project involved the development of a machine capable of making the desired surfaces. Before this question was answered satisfactorily, it became necessary to find a suitable

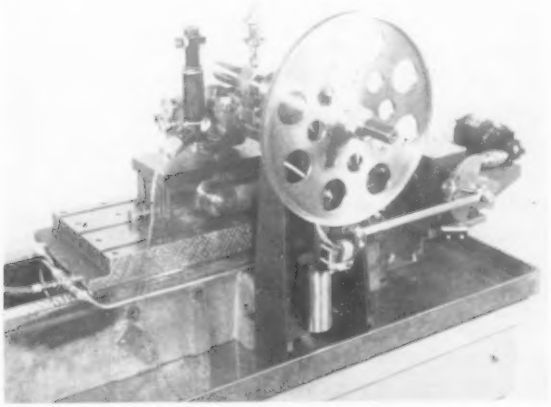


Fig. 2. This machine, developed by General Motors Research Laboratories, can rule as many as 10000 lines to the inch and as few as 300.

material on which to make the surface. Since the original surface would be much too scarce and costly for wide-spread use, a suitable method of duplicating had to be found and experience in its use built up.

Although development of production methods, materials, and duplicating methods was carried on simultaneously, each function will be described separately. When this project was first planned, a number of production methods were discussed, but the most suitable appeared to be the use of a ruling machine such as those employed for the manufacture of diffraction gratings. A number of test rulings were made on the ruling engine operated by the Physics Department of the University of Michigan which indicated that machines of this type would be capable of producing the desired surfaces. After some experience had been gained in the use of this ruling machine, a specialized machine for this project was designed and built by the Research Laboratories Division of General Motors. This machine is shown in Fig. 2. The ruling is done by a specially shaped diamond supported by a pivoted and counterweighted arm. The work is reciprocated under the diamond by a planer type movement, and the reciprocating table is floated on oil. Ruling is done

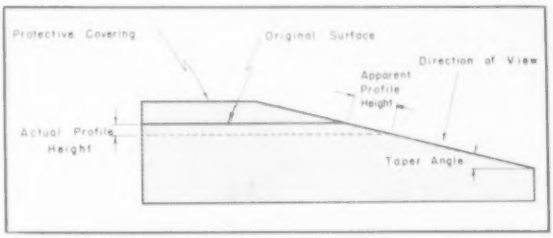


Fig. 3. This figure illustrates the basis of taper section magnification which is the basic approach for measuring the surface contour of the reference specimens.

only during the advance stroke; a mechanism lifts the diamond from the surface during the table return. During this return stroke, a lead screw is rotated by a magnetic indexing mechanism to advance the diamond into position for the next ruling stroke. Since originally built, this machine has been modified extensively to improve its operation and at the present time gives very reliable and reproducible results. It is capable of ruling lines of pitches as fine as 10,000 to the inch and as coarse as 300 to the inch. Since the desired number of lines per inch is determined by the angle and depth of the surface contour, it has been found necessary to provide three toothed wheels for lead screw indexing of 500, 419, and 268 teeth respectively. These three wheels enable rulings to be made of all the desired roughness values having pitch errors which exceed 10 microinches in only one case. Recently the original planer motion has been revised to give constant velocity between the diamond and the surface being ruled during the ruling stroke. A number of other detail modifications in the indexing mechanism, the diamond support, and the dash pot controlling the movement of the diamond support arm have been made to improve the performance of the machine.

Some early experiments in ruling surfaces on steel and on nickel served to establish the requirements for a suitable material for this work. It was found that the ruling process did not remove any metal but rather embossed the lines in the material being ruled. To insure uniform surface contour, a highly ductile material was required. The material must be capable of taking a high polish in order that all surface irregularities could be eliminated in preparation for ruling. These requirements are somewhat contradictory since highly ductile materials are generally difficult to polish. To satisfy the

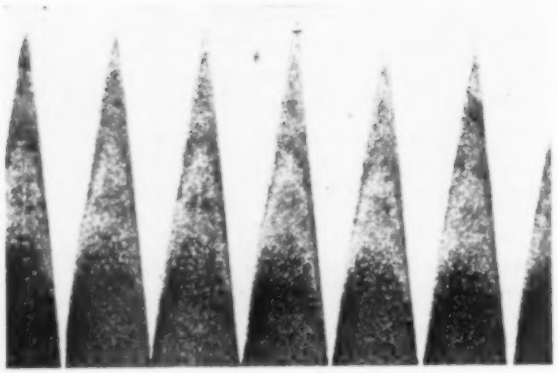


Fig. 4. A taper-sectioned part of one of the reference specimens.

requirements of the duplicating process, the material chosen must be chemically inert. It was also found that, since no material has been removed, the ruling diamond pushed up a ridge on either side of the line being ruled and that it is highly desirable that adjacent ridges should cold weld together under the pressure exerted by the diamond. In addition to these specific requirements, a high degree of homogeneity is necessary to insure uniform ruling depth. The only material which has been found suitable for this work is pure gold. The early work done on the project used an electroplated layer of gold which was hand polished to the desired degree of smoothnes and flatness. It was found that in spite of statements in metallurgical textbooks, gold is susceptible to cold working, so that the hand polishing operation introduced varying degrees of hardness over the surface of a single blank. With gold surfaces prepared in this way it was difficult to obtain uniform rulings. After a long series of experiments to try to improve this condition, it was finally discovered that gold rolled on a steel backing could be made sufficiently smooth and homogeneous to give high quality surfaces.

The study of the problem of obtaining in quantity highly accurate replicas of the original gold surfaces was undertaken by the Electroforming Division of the U. S. Rubber Co. which is now a part of the F. A. Ringler Co. The problem was to devise a method of electroplating in which the deposited layer has sufficient adherence to the gold to follow the surface contour to an accuracy on the order of one microinch, and which later could be stripped from the gold without either mechanical or chemical damage to either surface. The solution of this problem required several years of experiment and development work but has now been solved satisfactorily. The replicas which are to be used are made of pure nickel. The replica taken from the original gold surface is used as a master for the production of further nickel replicas which are in turn used as submasters for further duplication. The replicas which are available commercially are negatives of the original gold surface and are five ge erations removed from the original ruling. Th has been found necessary since each duplicati process involves trimming the edges of the origin sample in order to part the duplicate from the ori inal. This means that only a limited number o replicas can be made from each master and a singl calculation showed that a sufficient number of rep licas could not be made available until the fifth generation was reached. An incidental problem which came up during this development was that o producing an essentially stress-free nickel plate. If stresses are present, the electro-plated layer tends to warp and lose its flatness. If this process continues during several successive duplications, the final surface may be seriously distorted. The end product of the duplicating process is given a very thin (one to two microinches) coating of rhodium for additional corrosion and abrasion resistance. The hardness of the specimens is approximately 35 Rockwell "C", which is adequate to withstand repeated measurements.

The problem of measuring the surface contour of the specimens and determining how closely a given ruling corresponds to the intended contour also demanded considerable development before accurate results could be obtained. The depth of ruling of the finer specimens is of the order of a wave length of light, so that a direct optical examination of a cross section of a specimen is not practical. The basic approach used for measuring the surface contour of these specimens is the method of taper sectioning originally suggested by Mr. H. R. Nelson of Battelle Institute. The basis of this method is shown in Fig. 3. If, instead of a vertical cross section, one making a small angle to the original surface is used,

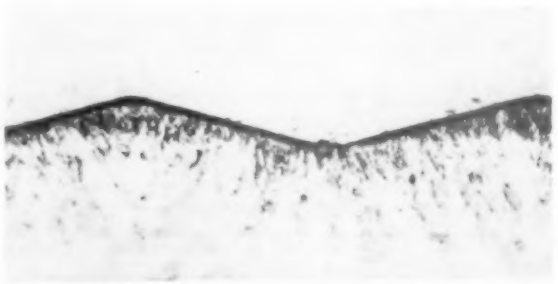


Fig. 5. Shown here is the actual profile on one of the finished specimens.

an added apparent magnification in one direction can be obtained. This added magnification is inversely proportional to the sine of the taper angle, and if small angles are used, can be made significantly large. In calibrating these specimens, an angle of approximately $2\frac{1}{4}$ deg is used, giving an added vertical magnification of 25 times. This is sufficient to enable accurate measurements to be

made with an optical microscope. Fig. 4 shows the appearance of one of the finished specimens on a microscope screen when taper sectioned. Fig. 5 shows the actual cross section of one of the coarser specimens. The vertical distortion introduced by the taper section is readily apparent. For comparison a taper section of a conventionally ground surface is shown in Fig. 6 to illustrate the great increase of uniformity of surface contour which has been achieved in the reference specimens. In calibrating a test ruling to decide whether it is sufficiently accurate to be used in a series of specimens, a total of 1800 individual measurements is made of the image on the microscope screen. This number of measurements is needed to determine both the average dimensions of a surface accurately and to insure that

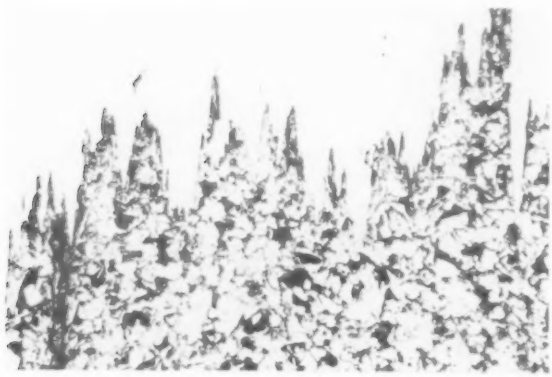


Fig. 6. A taper section of a conventionally ground surface.

no significant deviation from this average occurs at any portion of the ruling. The microscope used for this work is calibrated by a stage micrometer which has in turn been calibrated against a standard scale certified by the National Bureau of Standards. If the measured contour depth of a surface departs by more than three percent of the nominal value or by one microinch, whichever is the larger, it is not accepted for inclusion in the series of specimens.

At present, the available set of precision reference specimens consists of five blocks, the 20, 32, 50, 80 and 125 microinches. They are measured in arithmetical average. This group, shown in Fig. 7, allows the calibration of surface roughness instruments at sufficient points on the scale (or scales) to check the accuracy of the readings. Frequently several scales are used on such devices to expand the smoother values. These five blocks will usually allow each scale to be checked in two places, thereby evaluating the linearity of the instrument. Before using the blocks, they should be wiped off with a soft cloth to remove hard particles which could cause wear and damage. Although the surfaces are protected by a thin overplate of rhodium, it is possible to injure them by dirt.

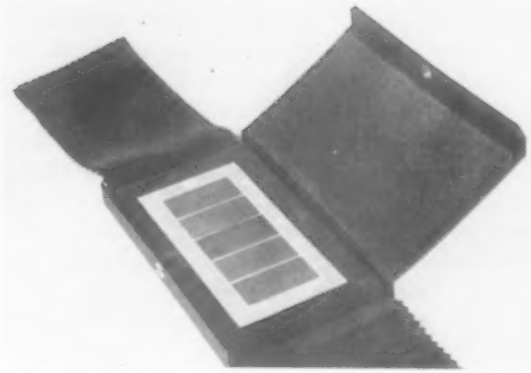


Fig. 7. Precision surface specimens are presently available in sets of five blocks.

Care must be taken to use only sufficient pressure to give good contact when applying the stylus or other device to calibrate the instrument. Too high a pressure will burnish down the peaks of the roughness rulings.

The blocks are extremely simple to use. The instrument to be checked is operated in exactly the same manner as specified for measuring the roughness of a machined surface and the meter reading is noted. With every set of blocks is a table showing what each roughness blocks should read depending on the radius of the diamond stylus and to take into account any other necessary corrections. For example, the "20" block, according to the table, may show that a 0.0005-in. radius stylus should read 16 microinches (arithmetical average). This block, when measured by the instrument, indicates 14 microinches. One must then decide if the calibration of the meter is close enough or whether a correction factor should be applied to all readings taken in this range. Alternatively, the instrument may have an adjustment for setting the meter to the correct value. However, before adjusting the meter, it is necessary to check the diamond for bluntness or chipping. This is done by reading the meter on the 80 or 125 block and on the 20 block. If the same correction factor is not applicable to both measurements, the diamond is likely to need replacement. Thus, if the 125 block reads 120 while the 20 block reads 10, it is likely that the diamond is damaged. The instrument may also have lost its linearity. Under such circumstances the device must be properly serviced before any minor adjustments can be made or correct readings taken.

It is essential to give consideration to how closely the meter should read to the values shown in the table accompanying the precision reference specimens. The readings are being taken in millionths of an inch and small changes in the stylus, the instrument mechanism, the block (such as wear) or variations in operation can readily make appreciable differences. It might be pointed out that measuring blocks of the "Jo-block" type are accurate to within

plus or minus four millionths of an inch in the best commercial grade. On very smooth surfaces of, say, under five microinches, the stylus cannot possibly read the correct value since it cannot penetrate to the bottom of the scratches.

In actual practice, nearly all machined surfaces are so variable in their roughness over even a ⅛-in. trace that it is impossible to judge the roughness value very precisely. Therefore, the possible difference between a meter reading on a precision reference specimen and the value appearing in the table is not likely to cause concern unless, of course, the difference is obviously large.

Instruments of the electrical pickup type require a tracing speed within limits prescribed by the manufacturer. To obtain correct readings from the blocks, the stylus must be drawn over them in accordance with such instructions. If the instrument is known to be in good condition, the precision reference specimens can be conveniently used to practice the speed of trace. As an example, selecting a 50 block, the stylus is moved at varying (but reasonably approximate) speeds. It will be observed that at too high or too low a speed, the meter reading will drop off. However, over a range of speed the meter indicates a relatively steady value.

On the other hand, the blocks can be used to see if the instrument is in good repair without the complication of tracing speed. If a mechanical tracer is available, it will give the proper motion to the stylus.

The blocks are made to calibrate any instrument which reads the average depth of the surface roughness. Certain roughness meters read by light reflection from the test surface. The precision reference specimens are not intended for use with such devices since the percentage of reflected light is not dependent on the roughness.

It must be pointed out that the precision reference specimens cannot be used for tactual (such as running a finger nail over the surface) or visual inspection. These blocks do not have the character of commonly machined surfaces and do not have the "bite" which is typical of machined surfaces.

Determining Number of Die Cavities

By G. W. K. Clark

NORTHERN ELECTRIC COMPANY, LTD.

PARTICULARLY IN JOBBING work, the designer is frequently faced with the problem of deciding just how many parts should be molded at one time, having in mind the condition that, while the manufacturing cost decreases with the number of parts per cycle, the initial tool cost is increased.

The following treatment provides a simple expression for determining the number of cavities which will give minimum combined cost. The factors involved are as follows:

n = number of parts to be molded per year.

a = tool cost in dollars of one molding die cavity, divided by the number of years over which the tool is to be depreciated.

This cost will include a proportion of the cost of the basic framework of the mold, to the extent that this varies with the number of cavities.

b = loaded labor cost in dollars of one cycle of the molding press operation.

c = loaded labor cost in dollars of setting-up mold in press during the year.

x = optimum number of cavities for minimum manufacturing cost.

y = the total cost of manufacture per year.

Then

Tool cost, per year $= ax$

Production cost, per year $= \frac{nb}{x}$

Total cost, per year $= y = ax + \frac{nb}{x} + c$

Differentiating

$\frac{dy}{dx} = a - \frac{nb}{x^2}$ (Note that set-up time disappears.)

y will be a minimum when $\frac{dy}{dx} = 0$

If $a - \frac{nb}{x^2} = 0$

then $x^2 = \frac{nb}{a}$

Hence x, the required number of cavities for minimum manufacturing cost $= \sqrt{\frac{nb}{a}}$

This relationship may be used to advantage in preventing a continuous loss due to initial undertooling, and can be adapted to the similar conditions which occur with punch press tooling.

A variant of this analysis would include the cost of the press when initial capital investment is being considered.

Broaching of Internal Gears

By Joseph A. Psenka

FIELD ENGINEER
NATIONAL BROACH & MACHINE COMPANY

Part I

BROACHING of internal gears on a high production basis for automatic transmissions and overdrive units exemplifies the close tolerances, good finishes and speedy metal removal possible with the broaching method and further illustrates the tremendous saving possible in tool cost, machines, labor and floor space.

Performance of gears is rated on the basis of quietness and life under operating conditions. Gear tooth characteristics which must be controlled within very close tolerances to obtain the desired qualities of quietness and life are involute form, lead, spacing, size and concentricity. A brief definition of each gear tooth characteristic follows.

Involute Form. The involute form of gear teeth is a curve that is described by a point on a line which is unwound from a circumference of a circle called a base circle. In simpler terms, the involute form is a type of cam profile which permits movement of gears with uniform angular velocity. Any variation of this gear tooth cam profile (involute form) from a desired form will result in over-stressing the teeth, causing excessive friction wear and noise.

Lead. The lead of a gear is the axial advance of the helix in one complete convolution and is a function of the cotangent of the helix angle and the pitch diameter of the gear. Spur gears in mesh operate on a theoretical zero helix angle. Any variation from a zero helix angle is classified as an off-lead condition. This same term applies in the full range of helix angles from zero through 90 deg.

Any off-lead condition causes end-bearing, which is contact of the gear teeth at the ends of the teeth, rather than on the full face of the teeth. End-bearing, according to one prominent automotive research engineer, is the cause of 90 percent of the failures of gear teeth, since localized loading causes extremely high unit pressures and subsequent tooth breakage from the fatiguing of the metal.

Spacing. Spacing may be defined as the correct angular position of gear teeth about the pitch diameter of the gear, each tooth equidistant from another. Any off-spacing of the gear teeth will result in a strut action causing an interference of the cam profiles (involute forms), resulting in noise, friction and wear, and concentrated stresses.

Size. The size of gear teeth is defined as the thickness of the teeth at a theoretically calculated diameter called the pitch diameter.

The size of the teeth determines the amount of running clearance (backlash) between the teeth. Insufficient clearance causes binding or cramping of the teeth resulting in noise, wear and fatigue.

Concentricity. Concentricity may be defined as the positioning of all gear teeth in such a manner that corresponding points on all gear teeth are equidistant from the axis of rotation. Lack of concentricity (runout or eccentricity) will cause an interference or cramping condition as the teeth on the high point of eccentricity move into mesh with the teeth on the mating gear, causing a cyclic gear noise.

The Involute Form and Broach Manufacture

Internal gears used in either automatic transmissions or overdrive units for passenger cars must of a necessity run quietly, since consumer resistance is immediately apparent when a noisy unit appears in the field. Most manufacturers stipulate a quality control tolerance of a maximum of 0.0003 in. on involute form.

Some desired involute forms are as follows:

Plant	Drive Side of Gear	Coast Side of Gear
#1	0.0000 to —0.0003	0.0000 to —0.0003
#2	0.0000 to +0.0003	0.0000 to +0.0003
#3	0.0000 to +0.0003	+0.0007 to +0.0010
#4	—0.0003 to —0.0006	—0.0003 to —0.0006

These desired involute forms are measured from the major diameter, i.e., the initial zero setting

Presented at the Twentieth Annual Meeting of American Society of Tool Engineers, March, 1952.

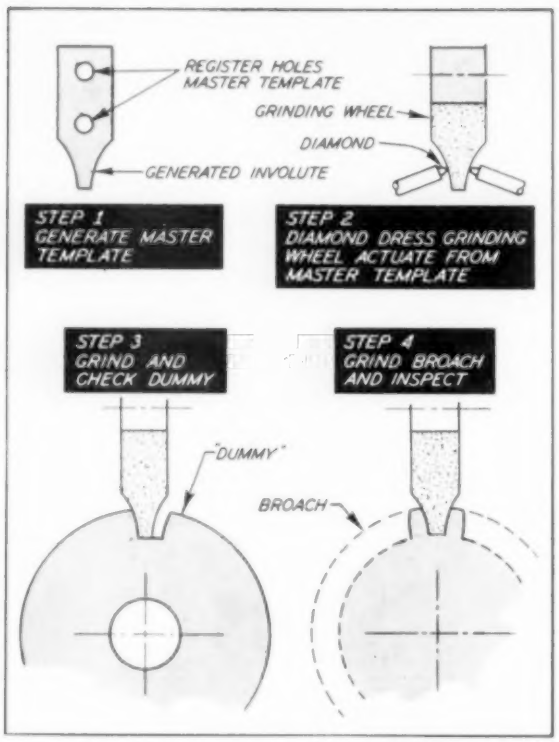


Fig. 1. In duplicating broaches, the four steps shown above are involved. The manufacture and checking of the broach revolves about the base circle.

of the involute checking instrument is set at zero with the checking pointer near the major diameter and above the highest point of contact with the mating gear.

With such close limits on involute form on the parts, of immediate importance is the factor of duplication of the involute form on repetitive broaches. Undoubtedly, an experimental broach could be manufactured to suit the desired involute form requirements, but automotive gears are of a high production process requiring, say, 25 to 50 broaches yearly.

In order to understand this problem more fully, one has only to consider that gage makers' tolerances on involute forms run to the order of 0.0002 to 0.0003 in. In actuality, for the broach to produce parts within the 0.0003-in. involute form tolerance, the broach becomes, in effect, a super gage of from 36 to 72 in. in length.

One automotive parts plant has broached in the years 1949, 1950 and 1951 well over 2,500,000 internal gears for overdrive units to the desired tolerance of 0.0003 in. on involute form.

The secret of duplication of broaches to a 0.0001-in. tolerance on involute forms is that the manufacture and checking of the broach revolves about the base circle, which if the definition of the involute form is recalled, is the circle from which a series of tangents are unfolded to generate the involute form. See Fig. 1.

Master involute templets are used to dress the grinding wheels producing the involute form on the broaches. These master involute templets are made of hardened high-speed steel, and the involute form is generated onto the templet by the use of a special machine designed and built for this specific purpose; the master templet is actually generated from a base circle on this machine. Two reference holes held very accurately for size and center distance are used as location points in the involute generating machines.

After the master involute templet has been inspected for involute form, it is placed in the dressing mechanism in the spline grinding machine, using the reference holes for location. Diamonds which dress the grinding wheels are actuated in their involute sweep from the master templet. The involute form is then ground on a dummy, which is a check disc, either on the rear follower diameter of the broach or on an arbor the same length as the broach.

The dummy is inspected on a vertical involute checker using a base circle the same size from which the master templet was checked. After approval of the dummy, the internal gear broach is rough, semi-finish, and finish ground. The broach is then inspected for involute form, using the same base circle as the nucleus for the check.

The Involute Form As Produced by a Broach

To comprehend the magnitude of the task which the internal gear broach performs, the action of the broach as it produces the gear tooth space must be fully understood.

Assume an internal gear blank with an inside diameter finish reamed to a 4.000-in. diameter in which internal gear teeth are to be broached to a major diameter (root diameter) of 4.250 in. See Fig. 2. The broach will produce the spline space by the simple method of each succeeding tooth on the broach increasing in diameter from 4.000 to 4.250 in. Each tooth corner contributes some portion of the involute form; there are no side-cutting or full-form finishing teeth on the internal gear broach.

The number of tooth corners on broaches operating in four different plants is as follows:

Plant #1 7890 (31-tooth gear) 4900 (25-tooth)
Plant #2 7980 (35-tooth)
Plant #3 4788 (42-tooth) 9912 (42-tooth) 14388 (66-tooth) 9372 (66-tooth)
Plant #4 6930 (33-tooth) 12462 (67-tooth)

This same cutting action of the corners producing the desired form is found in other types of spline broaches such as straight-sided splines, angular splines and serrations, involute splines, and special form splines. This cutting action is called the generating or nibbling action of the broach.

The Involute Form and Drift Effect on Helical Gears

The cutting corners on broaches for spur internal gears are in planes perpendicular to the axis of the broach, and the sides of the teeth at any particular point are parallel to the axis of the broach. This insures a uniform cutting action on all cutting corners of the broach.

The cutting corners on broaches for helical internal gears are also in a plane perpendicular to the axis of the broach, but the sides of the teeth at any particular point lie in a plane of the helix of the broach. See Fig. 3. This causes the cutting corners of any tooth to be obtuse on one cutting edge and acute on the other.

Because of the spiralling action of the helical broach as it moves through the internal gear blank, the part is driven against the obtuse side of the broach and away from the acute side. This results in a shortening of the desired involute form on the acute side of the tooth of the part, for, as the gear blank is driven into the obtuse side and away from the acute side, a radius is formed on the acute side of the tooth. This has been termed a drift condition as shown in Fig. 3, and continues until the tooth is of such depth that the bearing on the obtuse sides of the teeth retards this rotational drift.

Of course, this is highly objectionable, especially on the finer pitch automotive gears, for this causes

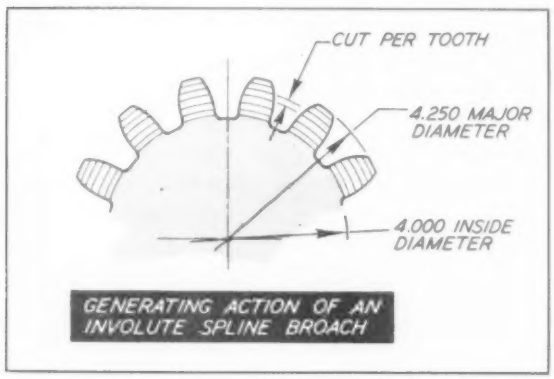


Fig. 2. The broach produces the spline space by the simple method of each succeeding tooth on the broach increasing in diameter.

a reduction in the operating profile of from 0.030 to 0.060 in. In order to reduce or eliminate this loss of involute form, several design changes were made on the broach.

Teeth on the broach were made thinner on the acute side by 0.030 to 0.060 in. than the final tooth thickness, dependent on the amount of drift, generates a narrow tooth space to a depth of 0.050 in., producing a tooth with drift on the acute side. The broach generates again from the ID of the part, removing metal only from the acute side of the 0.050-in. depth, and from that point out to the major diameter, generates the full width of space. This new design materially reduced the drift when the broach was sharp, but as the broach became dull, the amount of drift again became objectionable.

On pull-down broaching machines, parts were

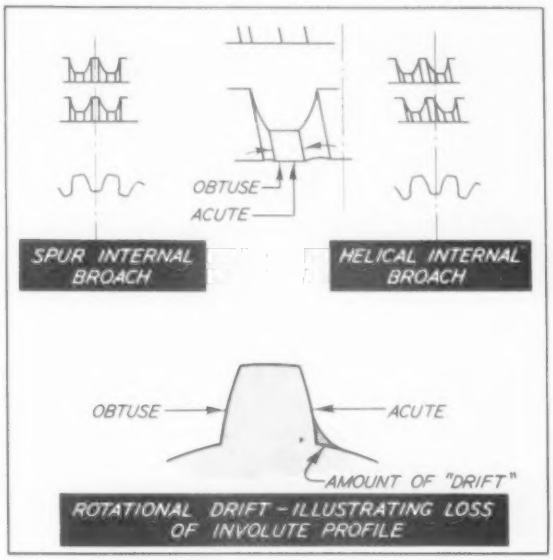


Fig. 3. The cutting corners on broaches for helical internal gears are in a plane perpendicular to the axis of the broach, but the sides of the teeth at any particular point lie in a plane of the helix of the broach as shown at the top. The drift shown at the bottom is caused by the spiralling action of the helical broach as it moves through the internal gear blank.

clamped, thus reducing the drift; on pull-up machines, which are not easily adaptable to clamping fixtures, serrated thrust plates were added, giving satisfactory results.

A final design of broach, as shown in Fig. 4, was made which generated a thin space with drift, but the second generating section made 0.050 in. high on the obtuse side in the same section that the acute side was removing the drift. This eliminated the loss of involute profile.

The Involute Form and Inspection

Internal gears are checked for involute form by locating either on the pitch diameter or on the OD of the part which is held concentric with the pitch diameter. Of the two methods, direct pitch diameter location is to be preferred, since an involute check can be made immediately after the broaching operation without the necessity of further machine operations which may allow errors to creep into the check.

In checking off the OD of the part in a pot chuck type fixture, slight additive errors may be made in the preparatory OD turning operation, since runout in the turning arbor or chuck will be reproduced on the part. Also, unless parts are very accurately ground for the OD, the clearance between the OD of

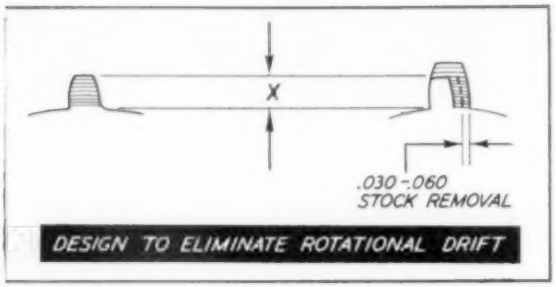


Fig. 4. The second generating section is made 0.050 in. high on the obtuse side in the same section that the acute side is removing the drift, thus eliminating the loss of involute profile.

the part and the ID of the pot chuck may cause the part to be off center during the form-checking operation.

The Involute Form and Face Grinding Burrs

The final steps in the processing of an internal gear broach after its naloy surface treatment are the face-grinding and face-polishing operations in which the cutting face of the tool is sharpened. In the face-grinding operation, appreciable burrs are left on the sides of the involute profile of the broach. However, the face-polishing operation, using a shellac wheel, not only imparts the final high finish to the face of the broach, but also removes enough metal to dislodge the face-grinding burrs.

After a broach has been face-polished, it is ready to produce production parts. Any face-polishing burr is removed by the first few parts broached and the desired involute form is produced.

After a production run, the broach is face-sharpened and put back on the broaching machine. The involute forms produced are usually very erratic on the first 25 to 50 parts, sometimes being off form as much as 0.0021 in., depending on the height of the burr, which has a side-shaving action of its own. The rougher the face grind and the higher the burr, the greater the variations and deviation from the desired involute form will be.

At one plant, careful checking disclosed that 75 parts 1¼ in. in length were broached before the face grinding burrs were removed and a smooth and desired form was obtained. Since this constituted parts which had to be salvaged by the gear finishing (gear shaving) process, an economical method of face-sharpening-burr removal had to be developed.

The most practical method of burr removal was found to be the broaching of cast iron blanks without the use of any coolant. The abrasive action of broaching of two cast iron blanks was found to be sufficient to condition the sides of the broach teeth to the point where passable gears were produced. The greatest effectiveness of the use of the cast iron blanks was found to be when the broach was run through the cast iron blank three or four times and, if possible, indexing the blank slightly between re-broachings.

In some plants abrasive-impregnated rubber wheels were tried; this removed the burrs but also rounded the sides and cutting edges of the broaches, producing negative cutting conditions and loading or metal pick-up on the sides of the teeth which in turn produced tears and streaks on the finished part.

Other plants tried broaching oversize cast iron pieces, rubbing the broaches from the back to the front of the broach, hoping to dislodge the burr; this proved time-consuming and practically ineffective.

The question may arise as to why the broaches are not face-polished after face grinding in the production gear plants. The answer is that the shellac wheels are so soft that only a highly skilled and observant face-polishing operator can keep from rounding the cutting edge and the sides of the broach teeth.

In plants where face polishing has been tried, the use of cast iron blanks for face-sharpening-burr removal has been found more satisfactory and economical.

A larger burr is usually thrown on one side of the broach than the other in the face-grinding operation because of the rotation of the wheel relative to the rotation of the broach. It is highly desirable where the parts are unsymmetrical and can be assembled in only a set position to grind the broach in such a manner that the face-grinding burrs are thrown to the coast side of the gear teeth, for if some parts are produced outside the tolerances, the more objectionable side of the tooth will be the least-used coastside.

Where the parts are symmetrical and may be assembled in such a fashion that the coast or drive side of the gear teeth may be produced by the same cutting corners, no advantage can be gained by controlling the side on which the heavy burrs occur. An exception to this condition might be where the faces of the parts might be marked, such as by spot drilling, and the parts broached and assembled with the spot up or down as the case may be. However, this becomes an added and costly operation.

On helical broaches, it is desirable to face grind with the heavy burr on the obtuse side of the tooth for two reasons: the burr is removed more quickly from the obtuse side because of the continually high-pressure and scrubbing action against the obtuse side as the broach spirals through the work, and because the movement of heat caused by the face-grinding operation should be into the obtuse corner, which can readily dissipate the heat, rather than into the acute corner. If the grinding wheel were sufficiently loaded with the metal particles, the acute corner could become burned and would break down in a comparatively short time.

(Continued next month)

Nomograph for Determining the Period of a Physical Pendulum

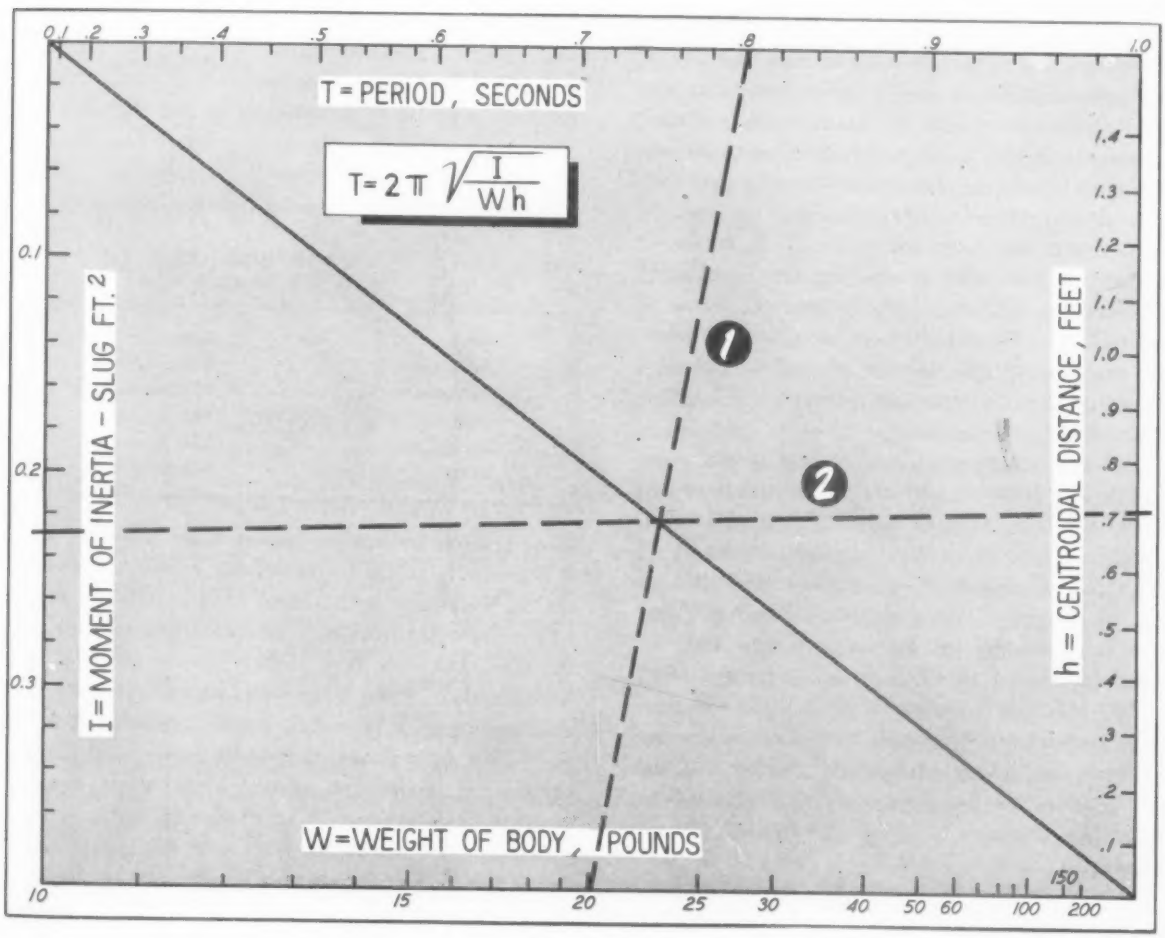
By Leonard M. Majeske
REGISTERED ENGINEER

IN THE DESIGN of machine elements, it is frequently necessary to consider the properties of masses which are mounted or suspended in such a manner as to closely resemble a physical pendulum, and to consider their oscillatory characteristics. In other instances it may be necessary to determine the mass center of a body from an observation of its period of vibration. The quantities involved are: the period of vibration, the moment of inertia of the body with respect to an axis through the pivot point, the weight of the body, and the centroidal distance to the pivot. The attached nomograph may be used to find any one of the quantities in terms of the other three. The use of the nomograph is illustrated by the following example:

Observed Period—0.8 seconds
Weight—20 pounds
Moment of Inertia—0.23 slug—ft^2.
Determine centroidal distance—h.

Solution:

Draw line (1) connecting weight and period on their respective scales. From I draw a line through the intercept on the turning line and extend to the h scale and read $h = 0.71$ feet. The range of the nomograph may be extended by multiplying the vertical scales by any factor.



Heat-Treating and Machining of Boron Steels

By J. D. Graham

WORKS METALLURGIST
LOUISVILLE WORKS

INTERNATIONAL HARVESTER COMPANY

Part I

A THEORY that has been supported for years by leading metallurgists and proven during the emergency substitutions of World War II is the Theory of Equality (for want of a better name). It is carefully phrased by Walter Jominy as follows: "Most American metallurgists believe that all steels, if quenched properly to martensite and tempered to a hardness between 200 and 400 Brinell, have very nearly the same mechanical properties."

Thus, hardenability becomes the principal factor in selection of steel for automotive parts, and it is on this basis that boron steels have been put into production with rapidity by many manufacturers. If a steel is proven capable of hardening to 90 percent martensite in the critical sections of a part with the heat-treat facilities available, it is reasonably certain that it will do the job.

Grossman, Field and others have developed tools with which to evaluate steels in concrete terms of hardenability. These tools have been used to determine the relative effectiveness of various alloys in improving this all-important property of hardenability.

Table I shows the amount of each of several common alloying elements required to increase the Ideal Critical Diameter (D_I) or hardenability of an 0.50 percent carbon steel by approximately one-half.

The fact that boron can replace hundreds of times its weight of other elements as a hardening agent has been known for some time. A U. S. patent was issued in 1921 on boron-treated steel. In 1937 the first commercial heat of boron steel was poured by the Wisconsin Steel Co. In the last ten years, and more particularly during the last year, development has been greatly accelerated by the serious shortage of alloying elements, principally nickel and molybdenum. Division VIII of the Iron and Steel Technical Committee of the Society of Automotive Engineers and the Alloy Steel Committee of the American Iron and Steel Institute have been major instruments in the rapid development and acceptance of these steels. Today they are no longer experimental—over a half-million tons have been made and used by industry and 50,000 tons will be produced this month. This use is conserving large amounts of nickel, molybdenum and other vital alloying elements.

It is important to remember that boron as a hardening agent is unique. It is not strictly an alloying element. Specific knowledge of how boron increases hardenability is still lacking. Its action may be something akin to deoxidation, removing in some fashion nucleation centers from the steel. If it is properly added to thoroughly deoxidized steel, the hardenability is increased by a certain amount which depends principally on the carbon content of the steel, but only very slightly on the amount of boron added. Since alloy steels of various hardenabilities must be provided, boron treatment is applied to a wide range of base analyses from plain carbon to fairly rich conventional alloy steels, creating various families or grades of boron steel, which are designated by AISI and SAE with the conventional nomenclature plus the letter B inserted in the middle. Several of these grades and

TABLE I—ALLOYS REQUIRED TO INCREASE D_I BY 50 PERCENT.

Boron	0.001 percent
Manganese	0.15 percent
Molybdenum	0.17 percent
Chromium	0.23 percent
Silicon	0.72 percent
Nickel	1.38 percent

Presented at the Twentieth Annual Meeting of American Society of Tool Engineers, March, 1952.

TABLE II—BORON SUBSTITUTES FOR CONVENTIONAL STEELS.

Grade	Mn	Ni	Cr	Mo	Substituted for
50 BXX	.70 - 1.00	.....	.40 - .60	.....	86XX
80 BXX	.70 - 1.00	.20 - .40	.15 - .35	.08 - .15	86XX
81 BXX	.70 - 1.00	.20 - .40	.30 - .50	.08 - .15	41XX
94 BXX	.75 - 1.00	.30 - .60	.30 - .50	.08 - .15	46XX
86 BXX	.75 - 1.00	.40 - .70	.55 - .75	.08 - .15	43XX

the conventional steel they are designed to replace are shown in Table II.

Addition of boron increases hardenability, and apparently nothing else. Accordingly, in replacing nickel, chromium, or molybdenum with boron, certain effects of those elements are lost, such as retarding softening or resisting creep at elevated temperatures.

Machining as Related to Heat-Treatment

There is much to learn about the machinability of steel. It is known, however, that hardness and microstructure are the governing factors in machinability, as they are with physical properties, and that chemical composition is of little effect except in its influence on hardness and structure. Recognition of this fact has been an important basis for much valuable work on machinability and cutting efficiency in the last five years. Since hardness and structure in most cases are the direct result of heat-treatment, a discussion of the heat-treating of boron steels will pave the way for comments on this machining.

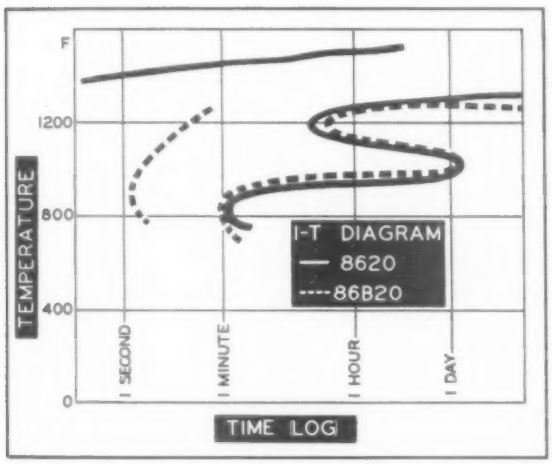


Fig. 1. Shown here is an I-T chart for 8620 steel with and without boron.

Isothermal Transformation

Bain and Davenport supplied one of the most useful means of checking on the nature of steel, in the Isothermal Transformation Chart, or ITT curve as it is sometimes called. These charts show the progress of austenite decomposition at constant

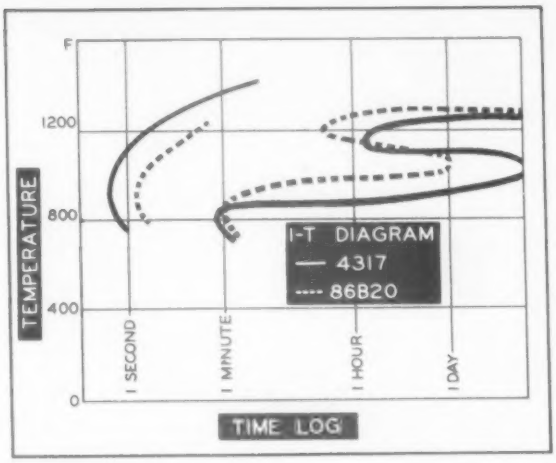


Fig. 2. An I-T chart for 8620 boron steel compared to 4317 steel.

subcritical temperatures. They are not strictly applicable to analysis of steel behavior during quenching, but with a recognition of the fundamental differences between transformation on continuous cooling and transformation at constant temperature, it is possible to use the IT chart quite intelligently.

Fig. 1 shows such a chart for 8620 steel with and without the addition of boron. Time is shown on a logarithmic scale. The curves show start and completion of austenite transformation. To achieve complete hardening, a steel must be quenched so that low temperatures at which martensite forms are reached (in this case below 750 deg F) before transformation to other products can start. The increase in hardenability is readily seen in the drastic shift of the line representing the start of austenite decomposition. In this case the addition of boron has more than doubled the hardenability of the steel. (D_0 increased from 1.75 to 3.65). However, it will be noted that the right-hand curve indicating completion of transformation is practically unchanged. This is a fundamental difference between the action of boron and that of the conventional alloying elements, which delay the start of transformation and also retard its progress. This difference is significant principally in annealing and normalizing. It means, in effect, that cycles for annealing of boron-treated steels will in most cases be about the same as for the same steel without boron. Since in most cases the boron steel is substituted for a steel of higher alloy content, this may mean a reduction in annealing cycle which is appreciable. Fig. 2 shows this same boron steel compared with 4317 steel. It may be seen that while the 86B20 steel has greater hardenability than the 4317 steel, it will transform completely in about 25 minutes at 1200 deg F instead of approximately 1¾ hours. When viewed from the standpoint of pro-

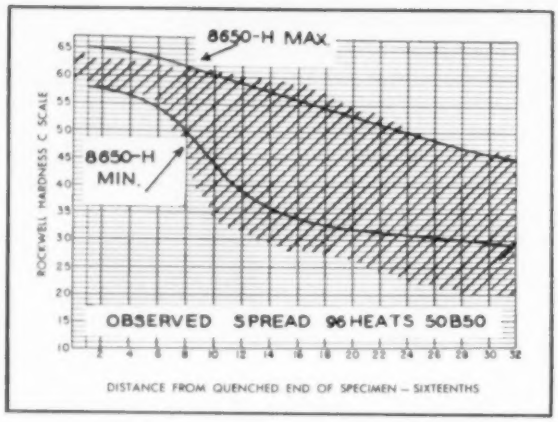


Fig. 3. Jominy hardenability range of 96 heats of 50B50 steel compared with the hardenability limits of 8650H steel.

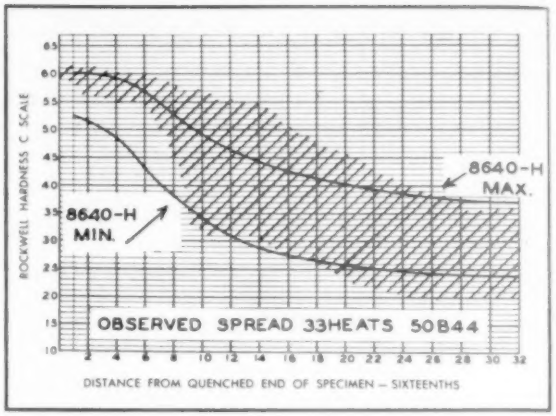


Fig. 4. Charted here is the observed spread of 33 heats of 50B44 steel compared with the hardenability limits of 8640H steel.

duction costs, this is a worth-while advantage of boron steels.

For practical purposes, the heat-treatment of boron steels should be discussed in two parts, the low carbon grades which are carburized to obtain surface hardness, and the medium carbon grades which are quenched and drawn.

Medium Carbon Boron Steel

Fig. 3 shows the observed end-quenched or Jominy hardenability range of 96 heats of 50B50 steel compared with the hardenability limits of 8650H steel. Note that the minimum heats take a drop in hardenability at about eight sixteenths. This is typical of the boron steels.

Many applications are not affected by this characteristic since the critical portions of the part being heat-treated are represented within the first half-inch of the Jominy curve. In the case of heavier sections, slightly higher carbon content is often specified to overcome this problem. Fig. 4 shows the observed spread of hardenability of thirty-three heats of 50B44 steel compared with the hardenability limits of 8640H steel. Keeping this in mind, boron substitutes for medium carbon alloy steels can be chosen on a basis of hardenability and hardened with no change in practice. Critical points and temperature of martensite formation are practically unaffected by the addition of boron, so that normalizing and hardening temperatures should be based on the conventional alloy content of the steel being treated.

Since boron usually replaces appreciable amounts of alloying elements which retard softening at elevated temperatures, it is often necessary to use draw temperatures from 50 to 100 deg F lower than with conventional steel of similar hardenability to maintain the same hardness level. There is no reason to believe that boron steels are particularly subject to loss of ductility in the so-called blue brittle range of 500 to 700 deg F. If requirements are such that tempering in this range has been avoided—and it is well to do so where possible—lowering draw temperatures may be certain cases create a problem which can be overcome by selecting a higher carbon or higher alloy material which will permit maintaining draw temperature above this range without sacrificing hardness.

The problem of temper brittleness may be slightly aggravated since the boron replacement usually contains less molybdenum than the steel formerly used. This factor is probably minor, but for critical applications in which tempering over 1000 deg F is employed, it may be advisable to quench from this temperature until more information is available.

Comment has been made in the past on brittleness of boron steels. Early production efforts encountered problems of insufficient deoxidation and excessive boron additions, but these factors are now well understood and controlled so that with proper heat-treatment, normal ductility can be expected.

It is important to remember that for many parts, steels are being used of greater hardenability than is required. Selection of a steel that will do the job properly, rather than one of equivalent hardenability, is, of course, to be desired. If this is done, and the few basic points outlined above are considered, boron steels can be used for almost all medium carbon alloy steel parts. The Louisville Works of the International Harvester Co. has made this change completely and is using over 900 tons per month of medium carbon boron steels (50B44 and 50B50) with no change in processing except a slight decrease in draw temperatures. Results have been completely satisfactory. Throughout the company, 62 percent of the alloy requirements are now specified in boron steels. Medium carbon grades are 77 percent changed over, involving about 5,400 tons per month.

(Continued next month)

Simplified Machine Shop Control

By Roy Palmer

OUTLINED HERE is a simple practical method for controlling costs and work in progress in a machine shop so that when corrective action is indicated, it can be taken before the work has been finished. The main difference between the proposed plan and the present methods generally in use is that the information presented to the shop manager is pertinent and up-to-date, while the other type of report is frequently a summation of results of operations.

The smaller shop owner usually depends on his bank balance as a criterion of his operations. If the balance is not increasing, the owner begins to check cost estimates against actual production time, and to examine purchased material costs and expense items until he finds the leak. By the time he has discovered where corrective measures are needed, it is too late.

As the size of the shop increases, the cost control systems become more and more complex and cost accountant and engineers are introduced. In spite of this complexity and the addition of highly skilled personnel, the reports presented to a manager are accurate only after completion of the job in question, or after the annual inventory. From an analysis of such reports, it is usually possible to trace any excessive costs, and the most frequent cause for the difference between profit and loss on a job is the number of direct hours required to produce the item.

Most managers depend on their piece-rate earnings to give them a concurrent picture of whether the shop is operating at a profit or a loss. Piece-rate earnings depend on changes in inventory, and when inventory enters the picture, except once a year, the result is purely an estimate.

The proposition is made here that any of these controls are results based on estimates. Any control, if it is to be of value to the shop manager, must be based on factual data and should point out any weak spot in time to take corrective action. The large shop is nothing more than a series of small shops joined together under one management, so that any system which is satisfactory in the small establishment should be likewise in the larger.

All shops, whether they are large or small, have one main controlling factor in common. The average number of producing employees and the percentage of overhead personnel necessary for efficient operation is approximately the same. Table I lists such a shop.

TABLE I—RATIO OF PRODUCTION TO OVERHEAD PERSONNEL

Description	Producing Employees	Overhead Personnel
First Line Supervisor, Owner or Section Chief		1
Receiving Clerk and Material Handler		½
Shipping Clerk and Material Handler		½
Material Handler and Porter		1
Stock and Tool Keeper		1
Tool Maker		1
Inspector		1
Layout Operator		2
Stenographer and Shop Clerk		1
Lathe Hands	4	
Milling Machine Operators	5	
Drill Press Operators	3	
Screw Machine Operators	1	
Assemblers	5	
TOTAL	18	9

It is expected that there will be certain criticism regarding the ratio of expense to direct costs (E/D). The writer's own investigation of a great number of shops shows this figure varies from as low as 30 percent to a high of 80 percent, depending on nature of work; however, the only employee who enters into a method of control is the production employee.

It is the direct hours that the engineer or his equivalent uses to make up the estimate that is to be used for controls.

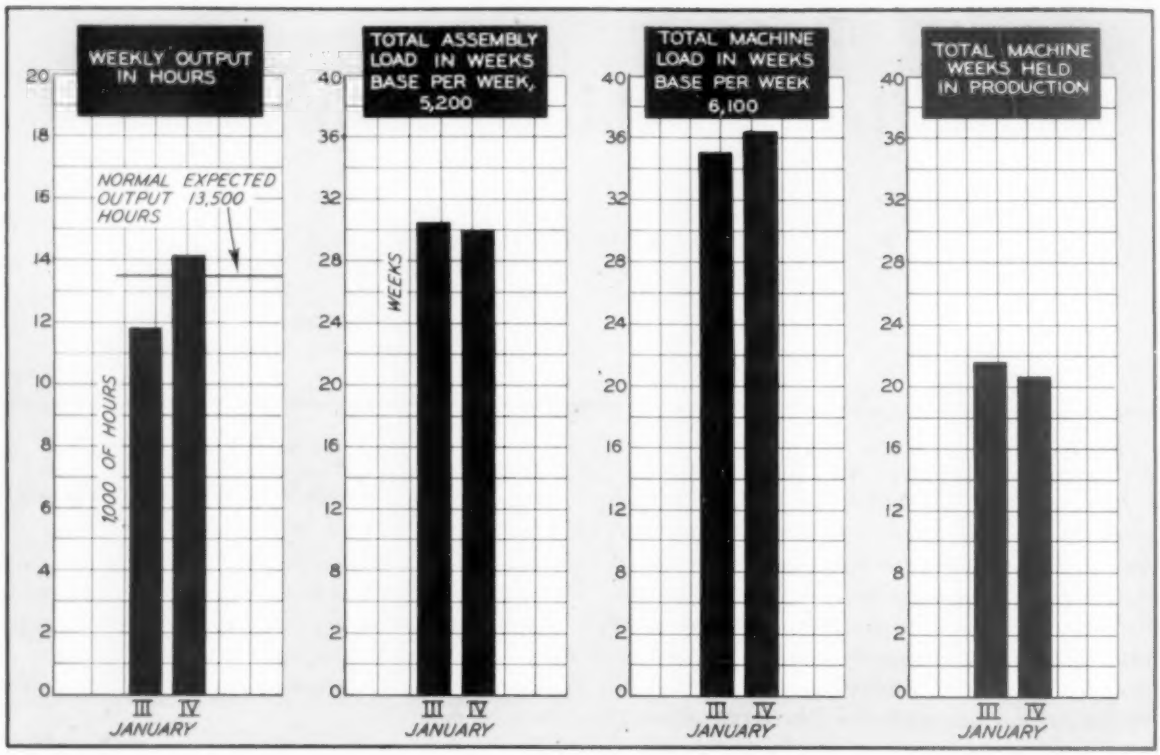


Fig. 1. Graphical presentation of sample production data.

Example: The shop has an order for 100 bushings. The engineer estimated 10 direct hours for producing the item. If a lathe hand produced this lot in 10 hours, regardless of the piece rate, scrap, etc., the shop broke even.

The simulated shop we portrayed in Table I had 18 direct employees on a standard 40-hour week. The ultimate capacity of the shop would be 720 hours. This figure cannot be used because every shop encounters factors which reduce the productive week to a realistic figure such as: tardiness, absenteeism, machinery breakdowns, time out for oiling and cleaning the machine or bench, rest periods, 55-minute working hour, fire drills, etc. This reduces the available number of hours for actually producing salable work from 40 hours a week to as low as 24 hours a week in some shops. In the simulated shop shown in Table I, the assumption is made that during 75 percent of the work week, the employee is producing.

The engineer or his equivalent who made up the shop cost estimate did not take into consideration the lost time per week. The engineer's hours are producing hours. The non-producing time is added on by the cost accountants and is included in a figure termed non-basic.

The simulated shop has a weekly producing capacity of 40 x 18 x75 percent or 440 hours a week that can be compared with the engineer's estimates.

If the shop produces week after week 440 hours of billable material, the shop then is 100 percent efficient based on the engineer's shop estimate and since it is the major variable in a cost estimate, the company should realize its normal profit.

The accountants will say that inventory or work in process has not been taken into consideration. Inventory has been discarded since it is an unknown quantity. No one knows without making an actual inventory and having every item inspected whether it is good merchandise, junk or material that has to be reworked. A fake inventory has wrecked more shops than any other item in the complicated business of operating a machine shop. It is admitted that a shop must have work in process (inventory); however, it is very difficult to meet a payroll on inventories.

TABLE II
COMPARISON OF TWO SHOPS' PRODUCTION

Weekly Period	Output in Hours Per Week	
	Shop A	Shop B
Jan. I	280	300
Jan. II	630	420
Jan. III	420	380
Jan. IV	580	400
Total for the Month	1910	1500
Average Weekly Output in hours	477½	375

It has now been established that the shop has a production capacity of 440 hours a week. If the shop clerk records the value of each shipment, in engineer's estimated hours, not the actual time required to produce the item, and summarizes the

(Continued on page 54)

Multiple Screw Machine Tooling and Methods

By C. R. Morgan
CONSULTING ENGINEER

CARBIDE FORMING and turning on automatic screw machines has not been a problem for some time. In the past, carbide tools on multiple-spindle automatics have not been entirely satisfactory, due to the relative inefficiency of drilling and threading operations. Therefore, carbides have played only a minor part when multiple tool setups are used, since feeds and speeds must necessarily be regulated to accommodate the slower operations involved.

Today, however, the advanced efficiency and application of drilling and threading makes possible such an increase of feeds and speeds that all tools involved in the set-up on automatics can perform to a more equal capacity. This capacity may be ten or twenty times the performance of present tooling and equipment, and with proper knowledge and utilization, this may be exceeded.

To realize the full importance of present developments, and in order to take full advantage of carbide possibilities, an extended program of education is required to better understand those possibilities and, most important, the proper use and care of carbide tools, coupled with machine and machine tool requirements.

New higher performance can be obtained only by a thorough knowledge of equipment requirements and complete understanding of the care and servicing of carbides. The known potential advantages are ten, twenty, or a hundred times greater than present performances. Tool life can be increased from 50 pieces per grind to better than 20,000 and this on the regular and standard production and equipment available.

This program is no minor project. It must include all of the following items, not necessarily in order of importance as listed, since each one is important in itself: proper machine equipment, tool design, re-design of tool holders, improved tooling; die heads, box tools, etc., accessories, speeds and feeds, lubricants, coolants, inspection, tool storage, planning and layout.

Proper Machine Equipment. Stability and rigidity in machine construction are a first consideration. Particular attention must be given tool slides, spindles, spindle bearings, increased speeds and feeds, greater motor power, chip clearance both in the tool area and in the machine base, coolant pumps, spindle seals, lubrication and calibration of tool slides and holders.

Tool Design. Improved tool design and methods must be employed to accommodate higher speeds and greater stock removal. Carbides do not function as did high-speed-steel tools; therefore practice in design and service must be changed. Where high-speed-steel forming tools were usually designed to complete a part to be made, it has become apparent that this practice is not satisfactory with carbides.

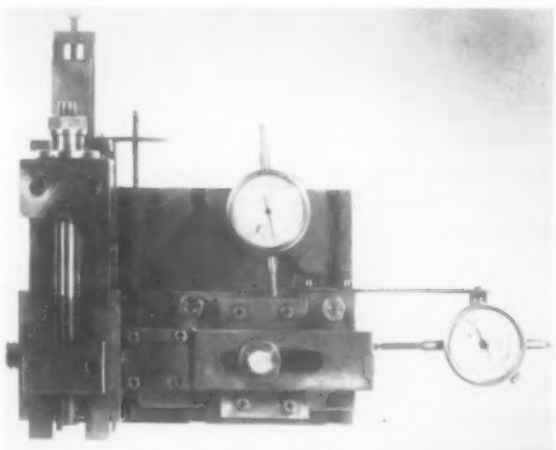


Fig. 1. Calibrated tool slide for automatic screw machines.

Where components have separate turns and shoulders are opposite, tooling should be so planned that two or more tools are used, so that clearances and

Presented at the Twentieth Annual Meeting of American Society of Tool Engineers, March, 1952.

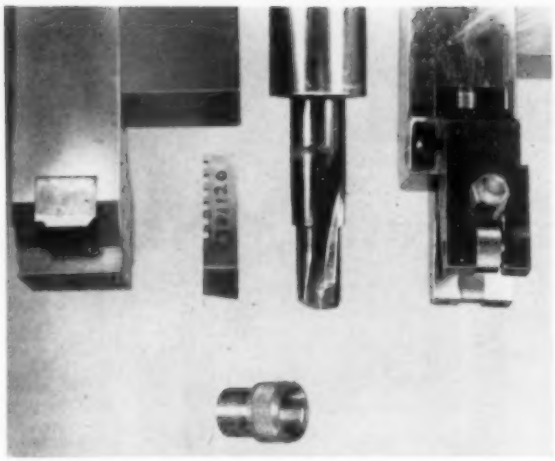


Fig. 2. Automatic carbide tooling cut-out cap.

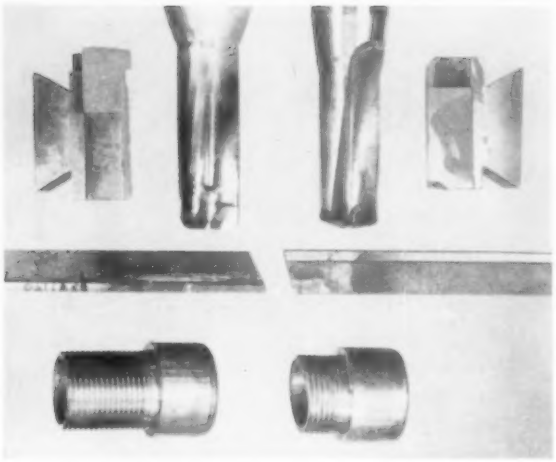


Fig. 3. Carbide-tip drills used for high production.

angles can be maintained, enabling wear to be decreased and excessive grinding and tool waste eliminated. Tools can be made at about one-third the cost of present design of tooling, and will outlast them at least five times in parts produced.

Redesigning of Toolholders. To obtain greater rigidity and more efficient holding, dovetail holders are being discarded and replaced by solid-block holders and tools.

With this construction, chatter and vibration can be eliminated; cost of holders and tools is automatically reduced and, as both are simplified, replacements are more easily obtained. These advantages automatically increase the operator's efficiency and reduce his maintenance and machine down time.

Die Heads and Box or Turning Toolholders. Simpler and more efficient tools of these types are now commercially obtainable. At present, carbide chasers outperform the diehead operations. Some improvement has been made by relieving the vacuum or suction in self-opening dieheads but sufficient progress has not yet been obtained. This condition should markedly improve when certain current developmental work is completed.

Machine Accessories. When high-speed-steel tools were used to produce a certain part, stock removal was around sixty or seventy surface feet per minute, and spindle speeds around three to four hundred revolutions per minute.

This was considered normal because drilling and threading, the usually limiting operations, were not as efficient in stock removal as were forming, turning, shaving, or other operations in removing external material.

However, when drilling and threading were raised to the efficiency of other operations, or in some cases exceeded their performance, spindle speeds and stock removal were increased from six to ten times that for high-speed-steel tools.

Therefore, the part that had been produced in ninety seconds could be and is now produced in fifteen seconds; it could be made in ten to twelve seconds if some conditions could be overcome that are the present limiting factors.

The fact that the piece in question required more than seventy percent of drilling and threading time, compared to about thirty percent turning and forming time, is evidence of the value of the drill and chasers and their part played in the time cycle reduction.

It is axiomatic that, as greater spindle speeds are required, increased motor power is necessary.

Again, if a tool efficiency program is to be carried out, the operator's servicing and its effects on how much can be done to relieve him for more essential work or for servicing a greater number of machines without increased effort must be considered.

Since, in the case cited, the cycle time has been decreased to one-sixth of former practice, the figures show something like the following:

In ninety seconds the operator could have produced about 40 pieces per hour gross, or 320 per eight-hour day. This would require lifting about 960 pounds of material per day. Running three machines per group, this would mean a total of 2,800 pounds.

His cycle time now is fifteen seconds; therefore, his gross would be 240 pieces per hour or 1,920 pieces per day. On three machines, this would make a total of 5,760 pieces per eight-hour day, making a total weight of some 17,000 pounds to be lifted per eight-hour day.

This, of course, is ridiculous. However, it shows the necessity of correcting each and every phase of the overall picture.

This condition, with others, makes it impossible for an operator to run three machines. Indeed, it is hardly possible for him to operate even one ma-

chine efficiently. Therefore, tool efficiency has been sacrificed at the start unless the project is carried to a conclusion.

The development of a stock elevator will not only relieve the operator of lifting the initial 2,800 pounds of material needed to produce 320 pieces, but will elevate into his machines the 17,000 pounds of material required to produce 1,920 pieces, without any effort whatever on the part of the operator. In so doing, 28 man-minutes per load are saved, or 168 man-minutes per day per machine, or a total 500 minutes saved on three machines.

This condition is also true of oiling equipment, chip removal, and set-up condition.

Spindle Speeds. Spindle speeds and feeds, if correctly used, are the controlling factor in the possible performance of improved tools. Closer fitting bearings and spindles with proper takeup adjustments, and constant and better lubrication, must be used.

As efficient, constant and greater spindle speeds are required, 50 to 75 percent greater motor power has not been found excessive, and is an essential requirement. Due to the higher speeds it has not been found necessary to increase feeds per revolution to any great extent, since stock removal is automatically increased with the higher spindle speeds.

Lubricants. Lubricating the equipment has already been briefly mentioned but must be carefully considered. With the increase of speeds and feeds, as well as stock removal, constant and efficient lubrication is required.

Coolants. Since greater production is possible due to better tooling and machine conditions, coolants play a very important part in our program.

Observations derived from our production experiences indicate: First, that as tools operate at greater speeds and produce work at a greater rate, they are in contact with the piece for a much shorter period of time, since the cutting operation is reduced on an average to about one-sixth of the previous contact time. Therefore, even with greater stock removal, there is less contact or cutting time to create heat in either tools or work.

Second, that parts or tools are not, therefore, distorted by heat generated and no change is occurring from extreme heat during cutting or changing to a normal condition when dropped off. Better finishes are also an advantage for the same reason.

However, a good water-soluble cutting fluid, from an extensive and prolonged research on production runs, has been found to give extremely better results over an oil coolant in that it contains sufficient lubricant for cutting purposes as well as machine preservatives, and offers unequaled advantage in keeping the work and tools at a cool, even, and normal temperature. Its use, therefore, results in the aforementioned advantages of better quality, closer tolerances and greater tool life.

Inspection. As parts are produced more rapidly, they should be accurately and swiftly inspected at the machine for inferior pieces. Although better tooling, equipment and coolants will automatically reduce waste and spoilage, pieces are nevertheless being produced at a greater rate. Where a possible 40 pieces were produced, it now is possible to produce 240 pieces per hour. For such production, inspection equipment in the nature of indicators, snap gages or other fast-reading instruments should be furnished. If an inspector were required to make his rounds once every hour, he would be inspecting a percentage of 40 parts produced whereas, at present, he is inspecting a percentage of 240 parts. Again, the best conditions possible are required.

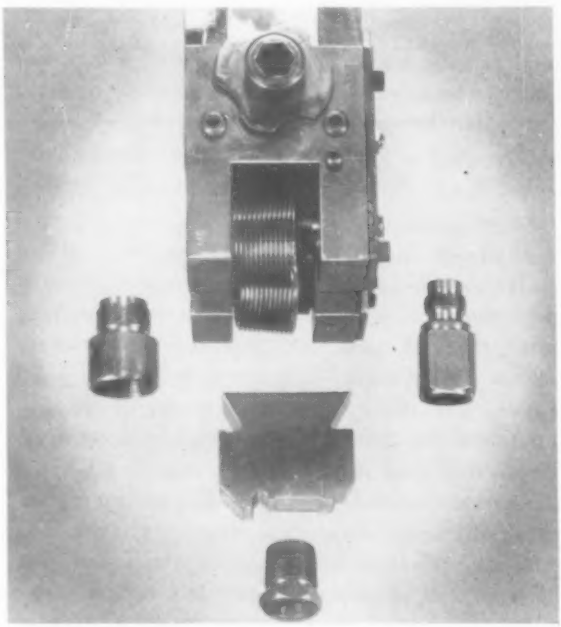


Fig. 4. Thread rolls and holder for rolling threads on automatic machinery.

Tool Storage. Servicing and storing of auxiliary tools should be as conveniently near as possible to the operator or machine where used. Every precaution should be taken in storage, since carbide cutting edges can very easily be damaged by improper handling. Tool replacement should be made as accessible to the operator as is possible for resetting and changes.

It is advisable that an accurate record be kept of tool life and replacements. Since the type of tools recommended are inexpensive, or at least are available at about one-third the cost of ordinary tooling, sufficient supplies can be maintained and proper records kept.

Planning, Layout and Methods. These are outstandingly important, in that if a job is properly diagnosed as to speeds, feeds, stock removal, tool sequence, proper tooling and equipment, gaging,

gearing, and camming, then and only then can operators and shop personnel be expected to function properly.

This group should be familiar with each and every tool's capacity in stock removal, and should know which, if any, are the tools to be favored, and how to regulate feeds and speeds accordingly.

Equipment and tools are capable of performing at a rate six times as great as has been achieved. If equipment is this efficient, then it must follow that the same amount of work can be produced on one-sixth of the machines now required. If each machine is worth twenty thousand dollars, how much can the machine inventory be reduced?

Where sixty automatics were required for production requirements, experience shows that forty machines are doing more work today, and if a complete change-over had been realized, twenty more could be discarded. The ideal will probably never be reached, but if those machines should be replaced under the old conditions, they would cost $800,000, not to mention their upkeep and tooling.

Machine Shop Control

(Continued from page 50)

total for the week, a figure has been established that can be compared with shop capacity and efficiency for that week can be computed.

Following is Table II showing the results of two shops, A and B, having the same identical producing capacity:

Analyzing this table, it can be readily seen that for the month of January, Shop A is making money. How about Shop B? For Shop B to be making money, Shop B must have produced a good inventory of 260 hours (440 x 4 equals 1760 — 1500 equals 260). With a condition shown in Shop B, it is time to investigate the shop work in process.

A section chief in a large shop handling 18 producing employees is a shop manager just as an owner of a small shop.

It is the manager's responsibility to decide how much work in process is reasonable for the shop to operate efficiently. Assume that work in process amounts to 2000 hours which is reasonable for the simulated shop shown in Table I.

Referring to Table II, shop inventory for the month of January in Shop A has been reduced by 200 hours (1910 hours shop output less 1710 hours shop capacity equals 200 hours). In Shop B, the inventory has been increased by 210 hours (1710 hours shop capacity less 1500 hours shop output equals 210 hours).

The two most important controls are the shop output compared with a bogey that is not estimated but actual, and control over inventory. These controls are on the shop manager's desk on Tuesday morning of the following week. If these figures are charted, he can tell how the shop is operating week by week and the results of the month's operations are available immediately, not six weeks to three months later as is the current practice.

As the shop grows, these controls become more valuable; for example, the shop is increased four times. This compares favorably with a department in a large organization having four sections. The capacity of the simulated shop or department has increased from 440 hours to 1760 hours. Table III shows the results of such a shop or department.

TABLE III
PRODUCTION IN A LARGE DEPARTMENT

Weekly Period	Output in Hours Per Week				
	Section A	Section B	Section C	Section D	Total
Jan. I	280	340	410	400	1430
Jan. II	630	450	290	480	1850
Jan. III	420	500	360	460	1740
Jan. IV	580	460	400	450	1890
Total	1910	1750	1460	1790	6910
Section Capacity	1760	1760	1760	1760	7040
Plus or Minus Variation	150	(10)	(300)	30	(130)

In analyzing this table, Sections A and D are on the ball and have a plus variation. Section B is falling below the requirement by 10 hours and Section C by 300 hours. The results of operation for the entire shop is 130 hours minus variation.

It does not require hours of concentration over figures to know that for the month of January, Section C is the weak spot. The shop manager recognizes that fact at the end of the second period in January when Section C produced only 290 hours. Again, at the end of the January III period, this particular section has fallen behind. Now analyze Section A. In the first period this section fell behind but the section chief, knowing he had fallen behind, took the necessary steps to correct the situation and by the end of the month had a plus variation. This is what is meant by control and not results.

Again the cry will go up that inventory or work in process has not been taken into consideration; however, the perfect operating shop has a constant inventory. No shop ever reaches this goal and inventory varies considerably.

Referring to Table III, the Section C minus variation may be due to legitimate increased inventory but the shop manager should make the section chief prove his inventory. This will call vividly to his attention his rising inventory and lack of deliveries.

It has been the writer's experience over the past five years that when the department chiefs and section chiefs know their output is being checked weekly and monthly, their problems, as far as profit is concerned, are practically over.

An Analysis of Cost Estimating Principles and Practices

By Lawrence E. Doyle

ASSOCIATE PROFESSOR OF MECHANICAL ENGINEERING
UNIVERSITY OF ILLINOIS

Part III

THE COST OF material is based upon the size of the rough stock used per piece. If a piece is machined, the amount of stock removed is added to the finished dimensions. The volume is computed from the dimensions. If the piece is irregular, it is divided into components of simple geometric shapes. The volumes of the components are computed separately and added together. The volume is multiplied by the density of the material to obtain the weight. Experienced estimators are sometimes able to judge the weights of intricate pieces, such as castings, surprisingly close by comparing them with similar pieces.

Materials in certain shops may be estimated in other ways. The length of bar stock, equal to the length of a piece plus facing and cutoff stock, is multiplied by the weight or price per inch of the diameter of stock as given in tables. The dimensions of a blank may be developed from the dimensions of a formed piece. The area, including scrap, per piece and gage size for a stamping is found from part dimensions, if the sheet steel used is purchased at a sheet price.

Estimating Material Cost

Some material is normally lost in processing in scrapped pieces, butt ends, droppings, etc. and must be accounted for in an estimate. Losses vary from one to twelve percent depending upon the process, material, and practice. An average allowance of five percent is often added to material estimates to distribute the bulk losses over the pieces produced. Sometimes an amount to take care of bulk losses is included in unit cost or overhead rate factors.

Presented at the 20th Annual meeting of American Society of Tool Engineers, March, 1952.

The weight of a piece is multiplied by the unit cost of the material to find the cost of the piece. The unit cost may include a prorated amount for bulk losses, purchasing, and handling in addition to the market price of the material. In making tool estimates as in Fig. 2, the estimator is guided by a list for various materials of unit costs that include all relevant charges. The rates for materials that require heat-treatment include a prorated charge per pound for heat-treating. Another procedure is to multiply the weight of the material by its market price. That product is then multiplied by a factor to cover other costs, as is done in Fig. 4B.

A scale of unit costs decreasing with quantity is realistic for materials purchased as needed. In a typical case, the price of grey iron castings for tools is quoted at $0.25 per pound for pieces weighing from 1 to 25 pounds, but is less for larger castings. For those weighing over 1000 pounds, the price is $0.16 per pound.

Unit costs need to be checked at intervals and changed if necessary. The intervals have been found to vary from 2 months to a year in various plants, with an average of about 6 months.

Estimating the Costs of Auxiliary Services

Just what auxiliary services are estimated individually for a specific job varies with circumstances. Engineering, testing, and runoff are commonly given individual attention, but not always. Production planning usually does not appear as a distinct item in an estimate except where a product is to be made in large quantities, and not always then. Such services as are not estimated separately are included in overhead.

Services that involve creative work or the solution of unforeseeable problems are not amenable

to standardization. Engineering design is one of them. The amount of time required to design a mechanical device may be estimated on the basis of what has been found necessary for a similar job or on the basis of the judgment of the designer as to how much time he will need. Whenever a sizeable amount is at stake, it is always well for an estimator to seek an estimate of the time required from those who will have to meet the estimate in performance.

Factors Included in Hourly Rate

The time estimated for a service, such as engineering, is multiplied by an hourly rate to obtain the cost of the service. If several grades of designers, draftsmen, or other workers are employed on a job, the rate may be different for the time expended by each group. The hourly rate covers more than the wages paid on the job. It includes charges for supervision, housing, light, heat, etc. Much design, research, development, and experimental work is done that cannot be applied to specific salable jobs. Engineering may be done to develop proposals that do not materialize in orders. Such costs may be included in the engineering rate or charged to factory overhead. In some places general administration and selling costs and profit are included in the engineering rate, as in Fig. 4A. In other cases, these items are accounted for by an additional rate.

When packing and shipping are not included in general overhead, they may be accounted for in various ways. For tool estimates as in Fig. 2, practice is to allow 10 percent of the material cost on the job with a minimum of $10. In other cases, shipping and packing costs may be prorated on the basis of total project cost.

Estimating Indirect Costs

Common practice in tool estimating is to apply a single rate to all time estimated for the toolroom or job shop. Part of this rate is for direct labor. The remainder covers overhead. Periodically the cost department adds together all the charges against the toolroom for supervision, light, heat, power, building, equipment, interest, taxes, insurance, maintenance, and many others. This sum is divided by the total hours of direct labor expended in the toolroom during the same period. The quotient is the overhead rate. The direct labor and overhead rate together comprise the rate the estimator uses to estimate the costs of making tools.

In making tools, some work may be done outside the toolroom. Patterns may be made elsewhere. All toolrooms are not equipped with jig boring or die-sinking machines, and work for those machines must be sent out. Heat-treatment and welding may be done in the same way. When such operations are estimated on the basis of the hours needed, the time for each is multiplied by a rate, often different from the toolroom rate and based upon prevailing commercial charges.

If a tool is sold rather than used in the plant where made, charges for general administration, selling, and a profit must be included in its cost. In one organization, the labor hours for a tool, made in the plant toolroom are multiplied by a rate of about $4.00 per hour. If the tool is to be made in an independent tool shop, the rate is about $5.00 per hour. The difference accounts for the management and selling expense and profit the supplier must charge.

On the estimate sheet in Fig. 4A, the rate of $6.10 under "Production Unit Time" includes the direct labor rate, factory overhead rate, and administration, selling, and profit rates. As previously explained, estimates are also made on this form for some products fabricated almost all or entirely by others. The costs of such products are not subjected to the rate of $6.10 because factory overhead is not chargeable against them. A "Marketing and Profit Ratio" for which space is provided is applied to such products to make it profitable to sell them.

Purchased Parts and Materials

Standard purchased parts and material are not generally required to carry factory and general overhead, although practice in this respect is not uniform. From a competitive standpoint, a manufacturer is not justified in adding a large markup to merchandise that can be purchased on about the same terms in the market by his customers. That the standard parts and material be charged with out-of-pocket expenses for shipping, purchasing, and handling is normally considered reasonable.

For some product estimating, the same overhead rate is used for most operations as described for tool estimating. That is essentially true of the estimating practice exemplified by Fig. 4A. Efficient estimating practice recognizes that overhead should be broken down to an extent corresponding to the detail in which direct costs are estimated. If direct labor operations are estimated on an overall basis, one or a few overhead rates are sufficiently accurate. If operation times are more minutely estimated, as is done for some products, overhead should be apportioned in a correspondingly refined manner.

Overhead cannot be distributed equitably if one article is processed with little or no equipment but is burdened by the same labor overhead rate as another that requires expensive equipment. Different rates may be applied to work in different departments or even on different kinds of machines

to refine the distribution of overhead. This requires that the direct costs estimated for each department or for each operation be kept separated. Overhead is distributed mostly but not always on a labor cost or hour basis for estimating purposes.

Detailed Product Estimating

The detailed form of product estimating utilizes different rates for different kinds of operations. These rates are determined by the cost department which accumulates the cost for similar operations in work centers. Several work centers may be contained in one department under one supervisor. Benefits like space, power, and water are charged to each center in proportion to amounts consumed. The costs of services such as planning, methods, and inspection are divided among the work centers in proportion to the amount each center is judged to benefit. Depreciation, interest, insurance, and taxes are charged on the equipment in each center. Other expenses such as for supervision and personnel services are allotted to each center in proportion to direct hours of labor. Direct labor is accumulated on the basis of wages paid plus fringe benefits. All the charges against a work center are added together for a period and divided by the number of direct hours worked in the center for the same period. The figure thus obtained is the rate charged against each productive hour estimated for work to be done in the center.

For the product estimating procedure illustrated in Fig. 6, administration and selling costs are charged in proportion to the number of dollars of standard manufacturing cost of major assemblies of a product.

Estimating Costs for the Future

When an estimate is to be carried out in a few days or weeks, current costs for labor, material, and overhead are usually safe. On the other hand, estimating may be quite hazardous when costs are to be incurred and returns realized after a lapse of months or years, such as after a period of designing, planning, etc. If costs should rise in the meantime, a serious loss may result. If prices decline, a product may not be marketable at the expected profit.

Present costs and quotations must serve as a start in preparing estimates for the future, but they may have to be modified by a forecast of conditions at the time of manufacture. An estimator must be in touch with economic trends or seek advice from some one who is to make a decision as to whether prices may rise or fall or whether the market will be more or less favorable.

Not only future prices, but anticipated volume and facilities must be studied. At a lower volume than expected, unit fixed and overhead costs tend to increase. A higher output may not only serve to alleviate fixed charges but also permit the utilization of more efficient work methods. Additional lines of products may absorb some of the overhead costs of a plant, or vice versa.

An estimator cannot hope to recognize cost trends unless he understands the principles behind the cost-accounting system that furnishes him with information. With such an understanding, he is in a position to appreciate why overhead rates are going up or down, the relation of overhead to shop activity, labor costs, and the general production picture.

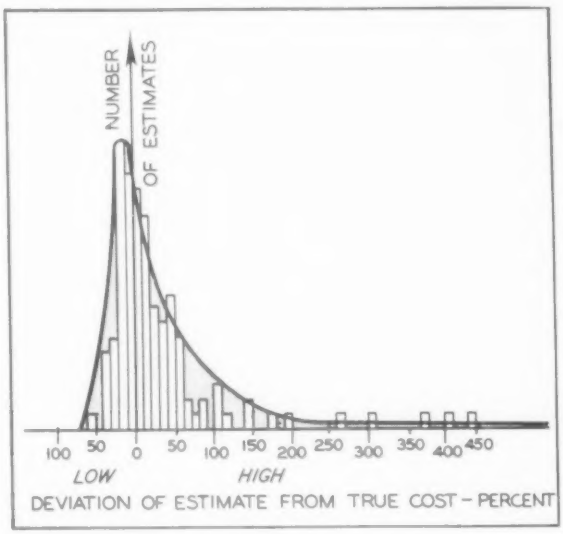


Fig. 8. If an infinite number of estimates were plotted and the pattern remained about the same, the distribution of errors could be represented by a curve like the one superimposed on the histogram shown here. Although the errors shown here cover a range of 500 percent, the estimate is only four percent above the actual cost.

The Advantages of Dividing a Project Into Its Elements

A project is broken down into its elements because that procedure makes cost estimating more accurate and dependable. This is brought about in two ways. First, errors in the estimates of the elements tend to offset each other when the elements are added together. Second, small elements are less complex, and can be estimated more accurately than larger parts or the whole of a project.

The Chance Factors of Cost Estimating

Every estimator knows that almost all his estimated costs differ from eventual actual costs. Some estimates are high, others low. Some are far wide of the mark, but others are close. That is found to be the case for estimates at all stages, from elements to overall projects, when they are checked against actual costs.

An example of how estimated costs deviate from true costs is given by Fig. 8. The percent error of each of 157 estimates of labor cost for making tools was calculated. Each bar of the chart represents the number of estimates within a certain range of 10 percentage points of error. The deviations range from 50 percent low to 450 percent high in this case. If an infinite number of estimates were plotted and the pattern remained about the same, the distribution of errors could be represented by a curve like the one superimposed on the histogram in Fig. 8.

An estimated cost differs from the real cost of an item because all the factors affecting the cost are not fully evaluated. Generally it is not worthwhile to expend the time and effort to investigate all factors fully. Attention is given primarily to the largest and most important, and many small factors are left to influence the results in a random manner. Some factors scarcely can be predicted at all with certainty. For instance, delays caused by defective material and machine breakdowns cannot be definitely foreseen by an estimator. A performance factor may spread such losses over all jobs, but the estimates then are high when everything runs smoothly and low when the worst happens. The estimator can naturally be expected to show some fallibility. The estimates upon which the chart in Fig. 8 is based were made in a period of prosperity. With an abundance of orders available, the estimator is inclined to avoid losses on doubtful jobs, and estimate them safely. As a result, the curve is skewed to the high side. However, most of the estimates show relatively small deviations. That is a general characteristic of good estimating practice.

Estimates Should Approach Real Costs

A conscientious and skilled estimator should find that the sum of a large number of his estimates is close to the sum of the actual costs of the jobs. Although the errors of the individual estimates in Fig. 8 cover a range of 500 percent, the sum of the amounts estimated for all 157 jobs is less than four percent above the total actual cost. Most estimators check their performances over various periods and modify future estimates by means of a performance factor to make them approximate actual costs on the average.

When a project is broken down into elements, the errors of some elements may be large, but probably the errors of most elements are small. Some elements are above, others below actual cost. When the elements are added together, their individual deviations tend to offset each other. Consequently, the likelihood of large errors in the total estimate is small.

Equal Size Elements Are Desirable

A project must be divided into elements of approximately equal significance to benefit fully from the compensations of chance. If a large part of a job is estimated without being examined in detail and only minor details are estimated individually, the large part has a preponderant effect upon the accuracy of the whole estimate. The refinement in estimating the minor parts may be futile because they carry little weight. For example, the cost of a special headstock for a machine tool is to be estimated. If the headstock can be made by replacing a few parts in a standard headstock, a reliable estimate can be obtained, from the established price of the standard headstock and a detailed study of the changes required. On the other hand, if the entire headstock is new, a breakdown must be made of all parts of the headstock into elements of approximately equal size to avoid the possibility that a sizeable error in estimating a portion of the project will result in a large error in the estimate of the total cost of the project.

The need to build up any estimate from approximately equivalent elements is recognized in good estimating practice as indicated by the chart in Fig. 3. Common practice in tool estimating is to estimate the operation time for each part, the material for each part without considering all possible material losses, and the overhead from one or a few rates. For more refined estimating for products produced in quantities, the operations are divided into elements, all factors affecting material costs are considered, and overhead is allocated according to kinds of operations.

The Advantages of Simplification

The spread of errors in estimating the costs of elements of a project is normally less than the spread when such projects are estimated on an overall basis. Likewise, the spread of errors in estimating small and simple elements should logically be less than the spread for large and complex elements if the same facilities are available for appraising both.

The breakdown of a project into smaller and smaller elements gives an approach to estimating with certainty, but never assures certainty. Consider a tool that is not a commercial item itself but can be constructed from standard commercial details. The present costs of the individual details can be found from catalogs or quotations. Current plant costs can be studied to ascertain how much should be added for purchasing, handling, assembly, etc. A series of such tools could be estimated quite accurately in that way, but some of the estimated costs must naturally deviate from actual costs over a period of time.

(Continued next month)

American Standard Tolerances for Ball and Roller Bearings

(Continued)

Table 13—Thrust Ball Bearings

Inch Dimensions

Dimension Series 030

Bore			Height	Outside Diameter		
Dimension in Inches		Tolerance in Inches	Tolerance in Inches	Dimension in Inches		Tolerance in Inches
Over	Incl	−0.0000		Over	Incl	+0.000
0	15/16	+0.004 +0.006 +0.005	±0.005	0	4 23/32	−0.002
15/16	1 15/16	+0.007 +0.006	±0.005	4 23/32	5 7/32	−0.002
1 15/16	3	+0.008 +0.008	±0.005	....	....	....
3	3½	+0.010	±0.010	....	....	....

Dimension Series 031

Bore			Height	Outside Diameter		
Dimension in Inches		Tolerance in Inches	Tolerance in Inches	Dimension in Inches		Tolerance in Inches
Over	Incl	−0.0000		Over	Incl	+0.000
0	1 3/8	+0.0008	±0.005	0	5 5/16	−0.002
1 3/8	2 3/8	+0.0010	±0.005	5 5/16	17 3/8	−0.003
2 3/8	3	+0.0012	±0.005	....	....	....
3	12	+0.0012	±0.010	....	....	....

Dimension Series 032

Bore			Height	Outside Diameter		
Dimension in Inches		Tolerance in Inches	Tolerance in Inches	Dimension in Inches		Tolerance in Inches
Over	Incl	−0.0000		Over	Incl	+0.000
0	15/16	+0.004 +0.006 +0.005	±0.005	0	5	−0.002
15/16	1 15/16	+0.007 +0.006	±0.005	5	10 3/8	−0.003
1 15/16	3	+0.008 +0.006	±0.005	....	....	....
3	3 1/8	+0.008 +0.008	±0.010	....	....	....
3 1/8	7 3/8	+0.010	±0.010	....	....	....

American Standard Tolerances for Ball and Roller Bearings

(Continued)

Table 14—Needle Roller Bearings

Industrial Needle Bearings

Bore or Outside Diameter in Inches		Tolerance in Inches
Over	Incl	+0.0000
0.0000	0.7500	−0.0004
0.7500	2.0000	−0.0005
2.0000	3.2500	−0.0006
3.2500	4.7500	−0.0008
4.7500	7.2500	−0.0010
7.2500	10.2500	−0.0012
10.2500	12.5000	−0.0014
12.5000	15.7500	−0.0016
15.7500	19.7500	−0.0018

Bearing Widths		
Outer Rings	+0.000	−0.005
Inner Rings with Outside Diam of 5 inches or less	+0.005	+0.010
Inner Rings with Outside Diam greater than 5 inches	+0.010	+0.015

Shaft Diameters for Series NAA and NBA*

Size of Shaft		Tolerance
From	To	+0.0000
0	4	−0.0005
4	6	−0.0007
6 and over		−0.0010

*AFBMA Designations.

Airframe Needle Bearings

Bore			Outside Diameter		
Bore in Inches		Tolerance	Diameter in Inches		Tolerance
Over	Incl	+0.0000	Over	Incl	+0.0000
0.0000	3.1250	−0.0007	0.0000	1.9375	−0.0005
3.1250	4.6250	−0.0008	1.9375	3.1250	−0.0006
4.6250	7.0000	−0.0010	3.1250	4.6250	−0.0008
7.0000	10.5000	−0.0012	4.6250	7.0000	−0.0010
10.5000	13.5000	−0.0016	7.0000	10.5000	−0.0012
.....	.....	.....	10.5000	14.5000	−0.0016
.....	.....	.....	14.5000	15.2500	−0.0024

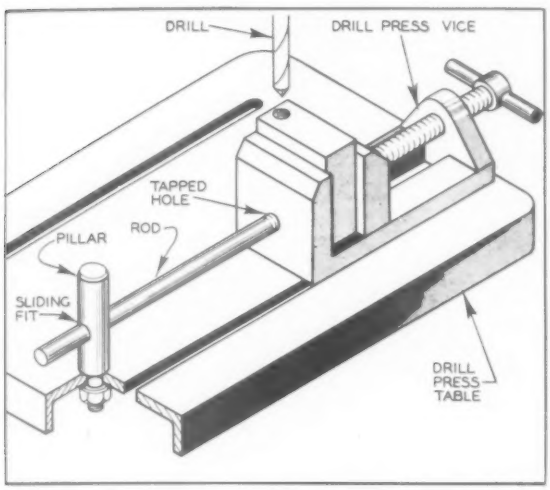
—American Standards Association

Gadgets

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Holding a Drill Press Vise

This is a mechanical device to hold a drill press vise which will prevent the vise from spinning when the drill catches in a job gripped in the vise, leaving the operator free to use one hand for holding down the drill press feed handle and the other to turn off the motor.



As shown in the sketch, a hole is drilled and tapped in the outside face of the fixed jaw of the machine vise. This tapped hole engages with the end of a threaded rod which extends toward the rear edge of the drill press table. At this point, each drill press is fitted with a short vertical pillar whose lower end is threaded to take a nut and washer. The vertical pillar is arranged to rotate in the hole drilled for it in the drill press table.

The tapped hole in the vise jaw takes the threaded end of the rod which fits loosely in a hole drilled in the pillar. In this manner, rotation of the vise is prevented while the drill is operating. A few turns of the threaded rod disengages it from the vise, which may then be removed in order to clear the machine table for other work. The rod and its supporting pillar can be swung out of the way when not in use.

Tom Brown
Middlesex, England

Wire Mock-up

Often during a discussion on a special type of wire form problem, it is difficult to reach agreement because there is a difference of opinion concerning how the part actually looks. The drawing usually shows sufficient views, but with a mock-up of the part in hand, it is much easier to arrive at a tooling solution.

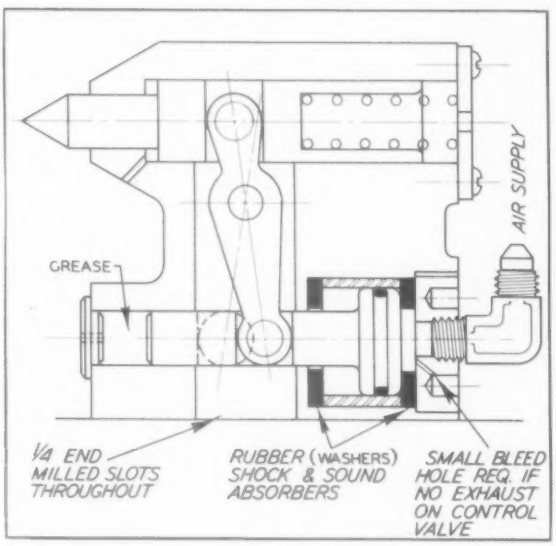
For this purpose, a pocket knife and a length of solder the approximate diameter of the wire used are all that are needed to make a solder mock-up from the print. During the tooling discussion, if a second mock-up is constructed progressively, each step can be analyzed for production methods.

Charles A. Haugk
Fort Wayne, Ind.

The Tool Engineer pays regular page rates for accepted contributions to these pages, with a minimum of $5.00 for each item.

Spring-loaded Center

In this spring-loaded center, the part is unloaded by turning on the air which retracts the center. The feature here is that should the air supply fail, the part will still be held in place by the spring pressure on the center. The center is compact and provides automatic loading in a minimum of space.



The center shown in the sketch is for a stroke of approximately ¼ in., but it can be scaled up or down without altering the basic design to fit most requirements.

The deep ¼-in. end-milled slot should be rough-drilled first with a series of ¼-in. holes and then finished with a quarter end mill. The ends of the actuating lever should be radium ground to work closely in the ¼-in. end-milled slots of the center piece and the actuating rod below.

A simple on-and-off valve is sufficient for controlling the air supply and will provide a cushioning effect if a small bleeder hole is drilled as shown.

George Hooey
Bronte, Ontario

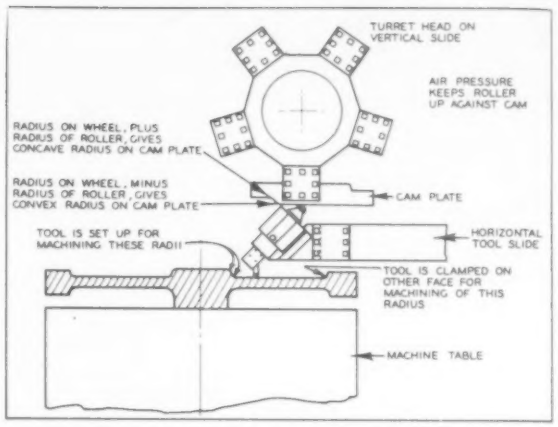
Cam Follower

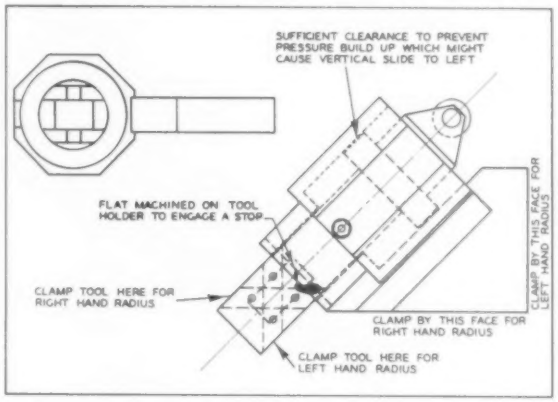
The air-controlled cam follower shown in the sketch is designed for use on a vertical boring mill. A major part of the work done on the machine has large radii, blended radii and tapers, and is made of very hard steel. This device, when substituted for the forming tools formerly used, eliminates undesirable chatter marks and reduces the machining time by about half.

The tool is set at a 45-deg angle because the feed of the horizontal side head is transmitted to the cutting tool without variation anywhere on the profile, whether the tool is cutting horizontally or vertically. It will also be noted that when making a cam, the radius of the roller must be taken into consideration.

Another point to be remembered when building the tools is that when grinding the piston head, if not too tight a fit is held, there will be no necessity to use a pressure-reducing valve on the air line. If the air shutoff valve is cracked open just enough that the flow from the cylinder is about the same as the leak from the cylinder, there will be no tremendous build-up of pressure.

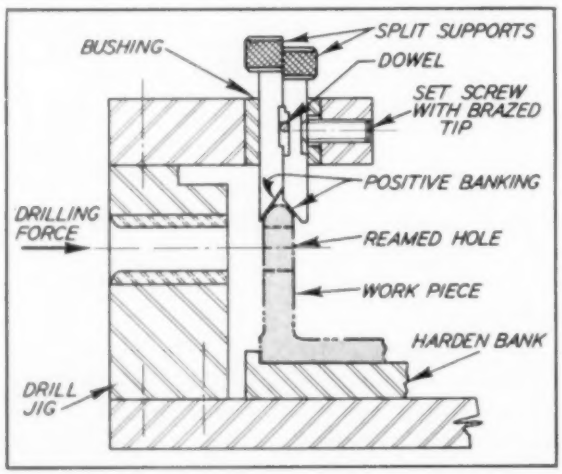
W. S. Boll
Cooksville, Ont.





Split Type Casting Support

Irregularly shaped castings are difficult to hold in a rigid position for drilling with a solid casting support and the result is frequently a high-rejection rate. This is caused by springing of the workpiece wall during the drilling operation.

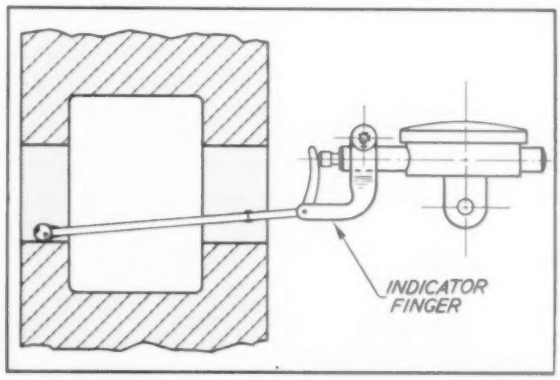


By using the split type casting support shown in the sketch, positive support is provided for the workpiece wall, and should result in a reduction of spoiled castings.

Frank J. Peragine
South Hempstead, N. Y.

Indicator Extension

When checking runout on a piece, difficulty is sometimes experienced if the place being checked is in an awkward position and the indicator dial cannot be seen. Shown in the accompanying sketch is an easy way to make an extension which will reach the place being checked and yet at the same time will allow the dial to be out in the open.



A piece of $\frac{1}{8}$-in. diameter cold-rolled steel about three or four inches long or more if desired can be brazed or silver-soldered directly to the end of the indicator finger. A $\frac{1}{4}$-in. diameter steel ball is brazed to the end of the rod as a contact point.

Roger Isetts
Kenosha, Wis.

Automatic Gaging

for In-Line Production

By Robert T. Kimmel

AUTOMATIC GAGING machines do for the inspection department what the larger transfer and automatic machines have accomplished for the production department. With these machines it is possible to equal the push-button efficiency of the production line which has been adapted by automation to continuous operation.

Unfortunately, not all types of products can be sorted or gaged in these machines, but the variety of pieces which are now processed will no doubt be surprising. Where a manufacturer has called in the gage makers, there has usually been some solution to the problem, and while not all of the resulting equipment is of the fully automatic type, these newer gaging machines have increased production considerably, and in most cases, have permitted a reduction in the number of operators.

A very important contribution of these automatic gages is in the increased accuracy possible, since the human element is eliminated entirely in some instances, only partially in others. If the machine is set up on a selection basis, the fully automatic variety will sort and classify parts according to size, rejecting the defects. In the type of machine in which an operator must load the parts one at a time, there is usually some indicating means which tells him which parts to accept and which to reject. Various examples of both of these types of machines are given later in the article.

However, before automatic gaging machines are installed in a plant, there should be a careful study made to determine whether the parts being made have tolerances close enough to justify this type of inspection. Otherwise, a very expensive piece of equipment may be bought to do a job which could be done just as well by other means. And, of course, as the name itself implies, there should be continuous production of a part in quantity.

The strict definition of automatic gaging connotes the absence of an operator. In this sense of the term, the equipment usually consists of a feeder or hopper of some sort to put the pieces into the machine. The parts are often delivered direct from the production machine by a conveyor. For parts such as ball bearings, the feeding mechanism presents no problem since the piece to be gaged can enter the machine in any position. When the part is irregular in shape, or when there is a definite attitude in which the piece must be positioned for gaging, the feeding mechanism becomes more complex. The next item is the inspection, classification and amplification section. The amplifier is included if the operator must read the measurements of the part, rather than merely letting the machine classify those parts which meet the specifications and rejecting those which do not. Sometimes, when the parts are loaded one at a time by an operator in the semi-automatic type of gage, a light or some other indication is sufficient to inform the operator whether or not the part is satisfactory. The third element of the machine is some means for disposing of the parts after they have been inspected. This part of the machine is usually a chute or series of chutes or trays into which the parts are sorted according to predetermined classifications. Included in most of these instruments are means for disposing of over and undersize pieces, and as many classifications of pieces within tolerances as necessary. An added accessory which is sometimes useful is a counting device for recording the number of pieces sorted, or even the number of pieces in each classification. When this provision has been made in one of these automatic gages, it is possible to determine immediately the status of parts then coming off the production line. The elimination of any lost time here prevents piling up parts which are not within tolerances.

Types of Gages

The devices suitable for, or adaptable to continuous or automatic gaging include, roughly, air gages, electrical contact type switches, electronic and electro-magnetic gages and penetration gages.

Air Gages

Air gages are devices in which a metered amount of air is passed through an orifice. The conventional type of air gage usually has a dial and a pointer which is operated by back pressure when the air flow through the orifice mentioned above is restricted by being presented to the workpiece to be gaged. In a newer type, the Precisionaire, the gage is actuated by the velocity or flow of air. There is no time lag in the response. Compressed air from the regular plant supply enters the gage through an automatic compensating pressure regulator, passes through a vertical transparent indicator tube and out through the orifice in the gaging spindle. An indicator float in the tube moves up and down the column to show the amount of air passing through.

Electrical Contact Gages

The electrical contact or switch type unit generally incorporates a spindle similar to that of a dial indicator, which touches the work. Changes in the workpiece move the spindle, which in turn can be made to actuate switches. Operation of these switches sets up electrical circuits which can be used to control the disposal means.

The switch-type unit has several advantages. It is the least expensive basic measuring device available commercially which will set up an electrical current which is proportional to the size of the part being measured. The repeat characteristics are very good, and are on the order of twenty-five millionths of an inch or better. While this means that the unit can be used for fairly close tolerances, using the customary 10 percent gage maker's tolerance, it is suggested that these be used for nothing less than plus or minus 0.00025 in.

The main disadvantage of this unit is that it is a mechanical device. If the spindle is moved too rapidly, which may occur when a piece to be gaged is passed under it, there is a tendency toward a disturbance at the electrical limits. This may cause apparently inaccurate gaging. This type of unit is not used to gage more than about 70 or 80 pieces per minute.

Electronic and Electro-Magnetic Gages

In the electro-magnetic type of gage, the spindle generally moves an iron core between a couple of coils. This type of gage is generally run with 60-cycle current flowing through the coils. Despite the electrical actuation of these gages, there are certain inevitable time lags. Suppose that an automatic gage is built to measure a small cylindrical piece, the piece to pass underneath either a cylindrically radiused contact or one with a very small flat. Since a cylindrical piece is being introduced under a cylindrical anvil, the maximum dimension or the time for

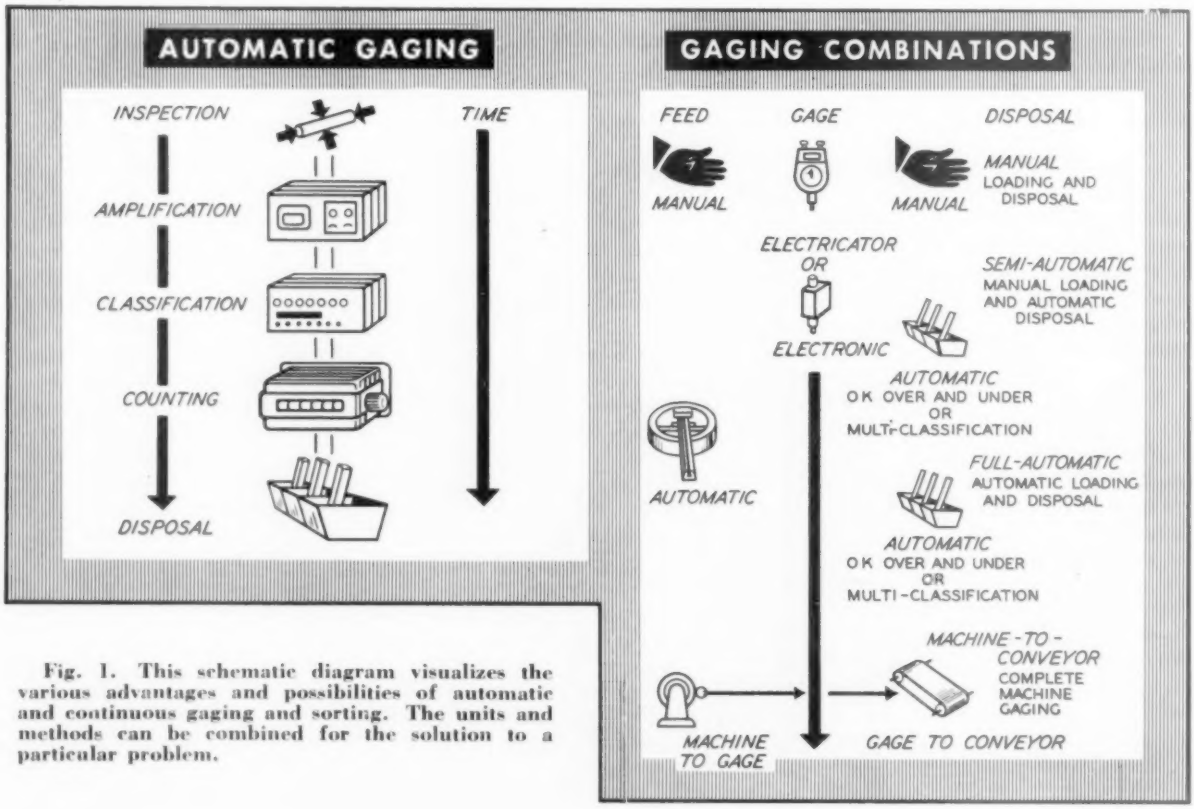


Fig. 1. This schematic diagram visualizes the various advantages and possibilities of automatic and continuous gaging and sorting. The units and methods can be combined for the solution to a particular problem.

Fig. 2. This roller bearing sorting gage can handle up to 22,000 parts per hour, the equivalent of the work of 10 inspectors using manual gages.

which the spindle will be in its uppermost position is going to be very short. With the gage operating on 60 cycles per second, it probably requires two cycles or roughly 1/30 second for the electrical circuit to reach equilibrium. That means that the piece has to be under the spindle for at least 1/30 second, and a little more to allow for a safety factor. While this may sound like a rapid rate of inspection, the material handling problems, along with this limit on inspection speed, will hold the rate to a maximum speed of 60 or 70 pieces per minute.

In the electronic-mechanical type of gage, one coil is attached to the spindle and two fixed coils are inside the gage head. Movement of the spindle, in accordance with size changes of the part, changes the relative position of the spindle coil to the other two coils. This is much like the gage just discussed, with the important difference that the current passing through the coils is operating at 100,000 cycles or more per second. Assuming the same conditions as in the previous paragraph, if two or three cycles are allowed for the circuit to reach equilibrium, 1/30,000 second has been used for the measurement. While the theoretical speed is never achieved in actual practice, this is roughly 1,000 times as fast as the gage using 60-cycle current.

The use of the electronic type of gage at maximum speeds is hampered by materials handling problems of a nature even more severe than with the electrical gage. Actual equipment has been built to operate at a rate of 400 pieces per minute. The parts being sorted were rollers in roller bearings. Tests indicate that the equipment can be made to operate at better than 500 pieces per minute. The scales with these gages can provide extremely high magnification on the order of millionths.

Penetration Gages

For applications where contact is not possible with the surface to be measured such as in a paper or steel mill, penetration gages can be used effectively. These devices may use some form of X-ray or other type of radiation device. The radiation apparatus is usually mounted on one side of the item to be measured with the receiver on the other side. Associated control equipment can be mounted in a remote location as described in the installation in a steel mill of an X-ray gage in a later section. In this type of application, the gage is usually comparing a sample of known thickness to the passing strip or sheet, with any deviations indicated on a meter.

There has been one successful installation of this type in a hot strip mill where the operator is no longer required to make adjustments when the strip is not running to size. The adjustments are made automatically by the gaging device.

Roller Bearing Gage

In the final inspection of roller bearings, the former technique in one plant required five inspectors to manually gage the small bearings, then sort them according to their outside diameters. This work was

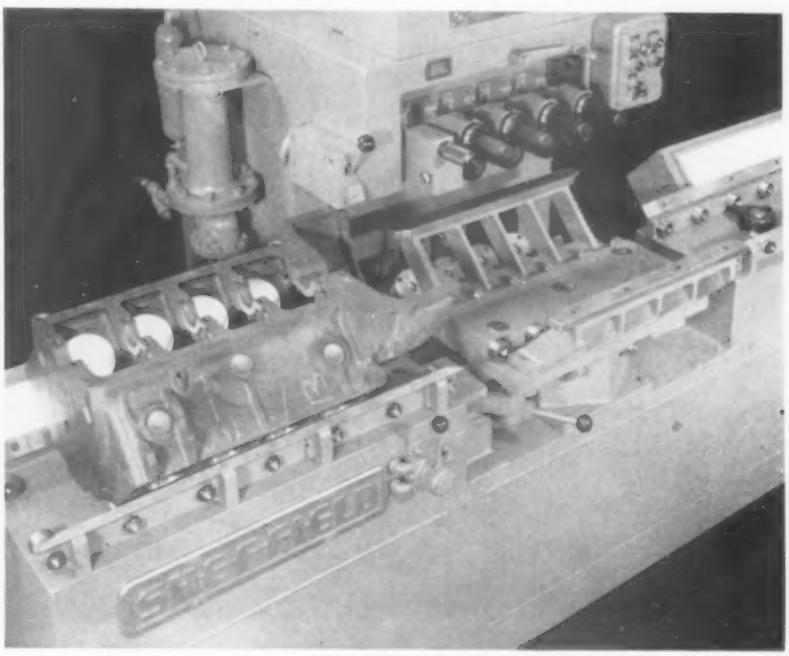
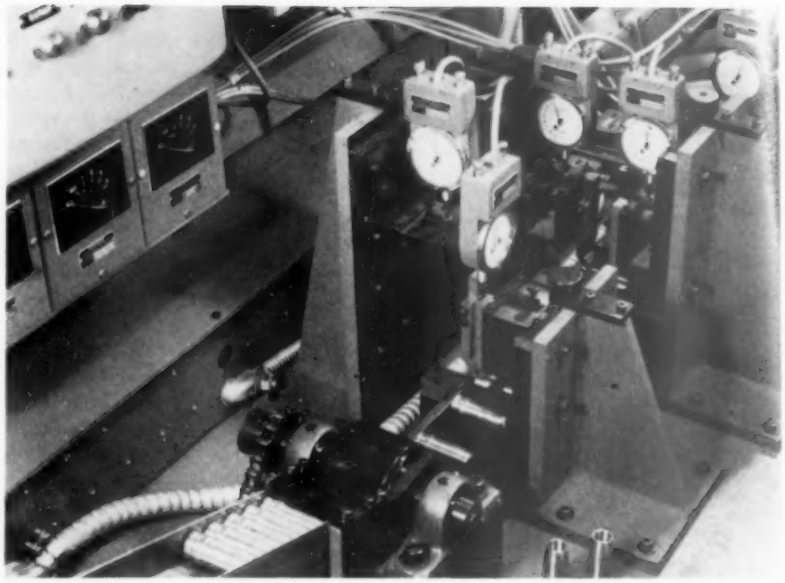


Fig. 3. After a quick visual inspection in front of the light panel, engine cylinder blocks are transferred to the gaging station where the bore diameters are inspected at 32 points simultaneously. The machine measures accurately to a ten-thousandth of an inch.

Fig. 5. A built-in memory makes it possible for this machine to classify and dispose of 22 mm shells after the gaging process has been completed. The shells are carried on a conveyor belt from the magazine where they enter the machine to the disposal chutes at the other end.



slow and tiring, resulting in a greatly increased chance for error during the last few hours of the day.

These errors are eliminated by the automatic gage, built by Federal Products Corp., now in use. See Fig. 2. The gage is completely automatic, and measures and sorts up to 22,000 roller bearings per hour into six categories each equal to 0.0001 in., plus oversize and undersize. Ten operators would be required to gage the same number of bearings in an hour. All operations of the gage are independent of the operator. From the rotary-type hopper, the bearings feed into the gaging unit where their diameters are measured, then drop into the correct classification tote box below. With this increase in speed of inspection, it is now possible to box and ship material on the day it is manufactured. In addition, a better product results.

The gage at present is running at slow speed and is keeping up with the production of two centerless grinders turning out approximately 7,000 pieces per hour. It is planned to add another grinder so that the higher speeds of the gage may be used. The production rate on the item has been increased five times while the unit piece cost has been reduced by two-thirds.

Cylinder Block Gage

A type of gage which is not automatic in the sense that the operator must load the parts to be measured and inspected one at a time is the Precisionaire machine for gaging automotive cylinder blocks. The machine simultaneously gages 32 bore diameters in the block for Go and Not Go and proper classification. Designed to fit into a production line, the instrument checks for diameter, taper and out-of-roundness of eight cylinder bores at four different points in each cylinder. In 45 to 60 seconds per block, the machine also classifies them to 0.0003 in. See Fig. 3.

Two of the machines are set in the production line. As the blocks come off the conveyor, they are placed first in front of a lighted panel for quick visual inspection. A starting button actuates the holding mechanism after the block is in place. Once the block is aligned, eight air spindle assemblies of four spindles each automatically elevate and enter the eight cylinder bores, stopping at a predetermined point. The floats in the 32 tubes fall simultaneously into position in the tubes, indicating the dimensional accuracy at four points in each bore. Should interference be encountered by any of the eight spindle assemblies in entering the bore, the machine will automatically stop and a red light will indicate the faulty bore.

A scale, graduated in 0.0003 in. and marked with numbers one to

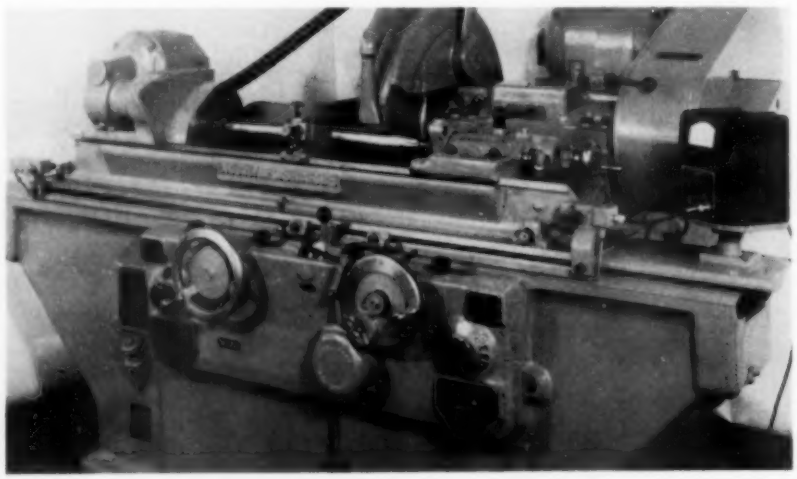


Fig. 4. A device which gages during the grinding process consists of an Electralign and two strain gages shown here mounted on a Brown and Sharpe No. 22 plain grinding machine. The meter at the right indicates any deviations.

ten, is mounted at the right of each set of four tubes. A transparent adjustable slide with two tolerance lines representing a variation of 0.0007 in. is positioned on a slide in front of each group of four tubes. If the bore is within tolerance, all four floats will fall within the tolerance limits, and classification is made on the basis of the position of the float in the right tube with reference to the number on the scale. This number is then manually stamped on the block opposite the bore by means of special stamping devices at the front of the machine.

One complete gaging cycle, completed in less than 60 seconds, represents a gain of considerably more than 100 percent in efficiency and production time over former methods. A second advantage is the greatly decreased amount of floor space required.

Grinding Machine Control

An electronic device called the Electralign, in combination with strain gages, is now being used to accurately set the swivel table of a grinding machine to grind a straight shaft or an exact taper. Precise table settings can be made exactly and swiftly, contributing materially to accurate manufacturing and size control. This arrangement uses the sensitive electrical resistance wire strain gage to detect swivel table movement and employs an electronic amplifier to magnify these movements to large scale readings on the instrument. By this means, direct measurements are made of small angular movements of the grinding machine swivel table relative to the sliding table. See Fig. 4.

In using this device, the operator makes a trial grind and measures the work to determine error. He then sets the selector knob to the inch value which represents the axial length over which he has just made his taper measurement and brings the measuring head spindles at each end of the table in pressure contact with the swivel table anvil. The next operation is to make the meter pointer read as many ten-thousandths off zero as his work was off taper. When the swivel table is moved through its regular adjusting mechanism enough to make the meter pointer read zero, the error in taper has been corrected. This correction may be accomplished during the grinding operation. While the machine is in operation, the instrument will indicate continually whether the part is being ground to size.

Shell Sorting Gage

A semi-automatic, magazine-fed, multiple-dimension Electricator gage measures four diameters, one groove depth and two lengths of 20-mm projectiles at an adjustable sorting speed of 17 to 80 pieces per hour. In this machine made by Federal Products Corp., shown in Fig. 5., the projectiles are sorted into three classifications: good, with all dimensions within tolerances; salvage, with one or more dimensions oversize, but none undersize; scrap, with any dimension undersize.

The main feature of this machine

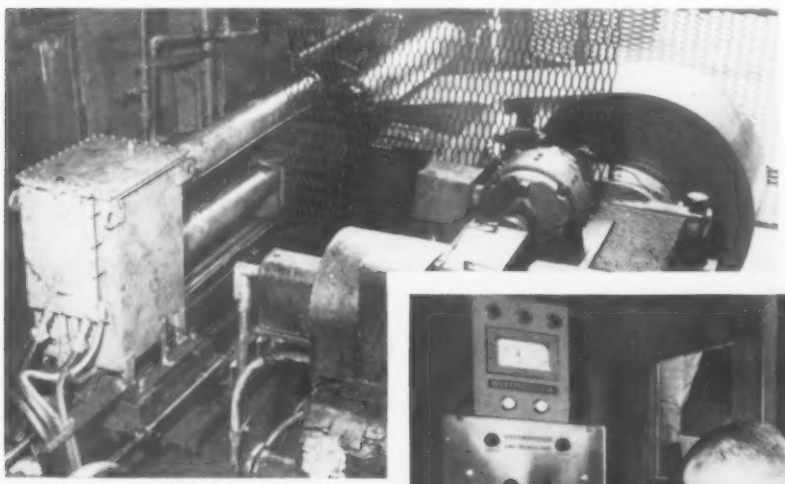


Fig. 6. This X-ray gage (above) is measuring the thickness of steel in a continuous-strip rolling mill. The receiver is located above the strip while the radiation source is below.

Fig. 7. At a remote control station (below), the operator in a continuous-strip mill can detect instantly any deviation in the rolled steel and make the necessary adjustments to bring the process back to specifications.

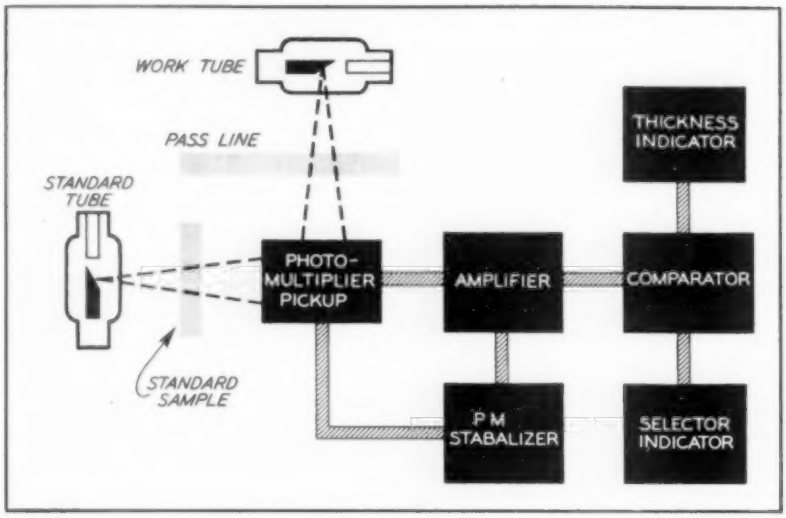


Fig. 8. This simplified diagram shows how a penetration gage, in this case using X-rays, works. A standard sample is continuously compared to the steel in the pass line by this particular gage.

is a memory unit which records the results of the measurement at three progressive gaging stations, and then provides the proper signals to operate the chutes in the disposal unit according to the correct classification. The shells are carried through the machine by a conveyor which dwells after each gaging station while the power unit connected with the gaging station causes the memory unit to operate.

Continuous-Strip Metal Rolling Gage

Higher rolling speeds in continuous-strip rolling mills are making it increasingly more difficult to employ contact gaging methods. Instead, X-ray gages are now available which will do the job, and at the same time eliminate the undesirable features of the contact gage. Basically, the X-ray gaging system compares the relative radiation absorption of a standard sample of known thickness to that of the unknown or "pass line" strip. The result of this comparison is shown on a thickness indicator directly in ten-thousandths of an inch above or below that of the standard sample.

The gage mount and the control station of a system made by Westinghouse is shown in Figs. 6 and 7. This particular installation consists of an X-ray generator unit, a sample positioning system and pick-up device, an indicator unit and the operator's control station. The system is shown schematically in Fig. 8. Regardless of strip speed, the gage measures strip thicknesses from 0.0050 to 0.1196 in. and is accurate to plus or minus one percent of the standard sample thickness. The thickness is checked 60 times a second, and the standard samples can be changed at the operator's control station in from one to ten seconds, depending on the degree of change.

Rolling Mill Magnetic Gage

A magnetic continuous gage made by Pratt and Whitney is designed for use on rolling mills, shearing lines, receiving inspection and final inspection lines to enable the operator to know the exact thickness of material at all times. The gage will show any variation of thickness to one ten-thousandth of an inch and will permit correcting or sorting of off-size material.

This gage has two rolls which are in continuous contact with the strip. The lower gage roll is mounted in the gage frame and contacts the lower side of the strip. The upper gage roll is mounted in a movable frame directly above and contacts the top of the strip. As the strip passes between the rolls, any variations in the thickness of the strip causes a change in the distance between the gage

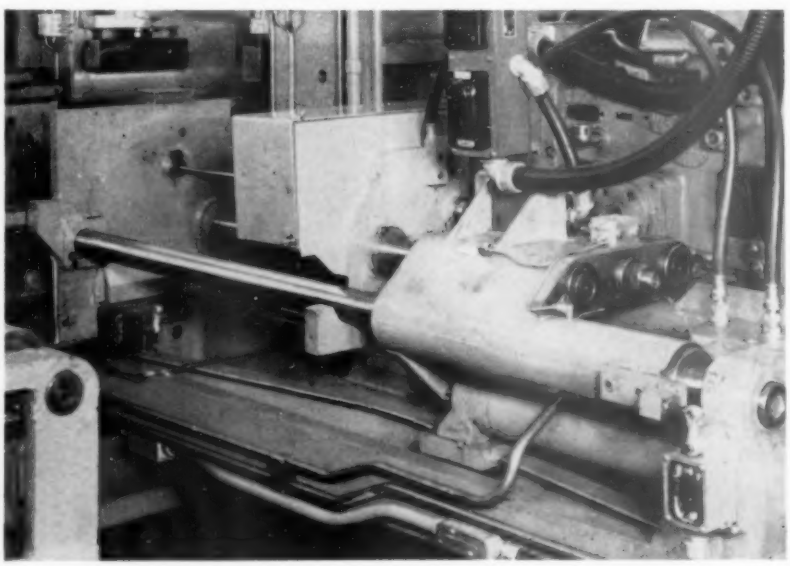


Fig. 9. Two inspection stations are built into this 27-station transfer machine to automatically check the depth of holes drilled, tapped and reamed in the ends of a six-cylinder engine block. The machine is stopped at the end of a cycle if any defects are found.

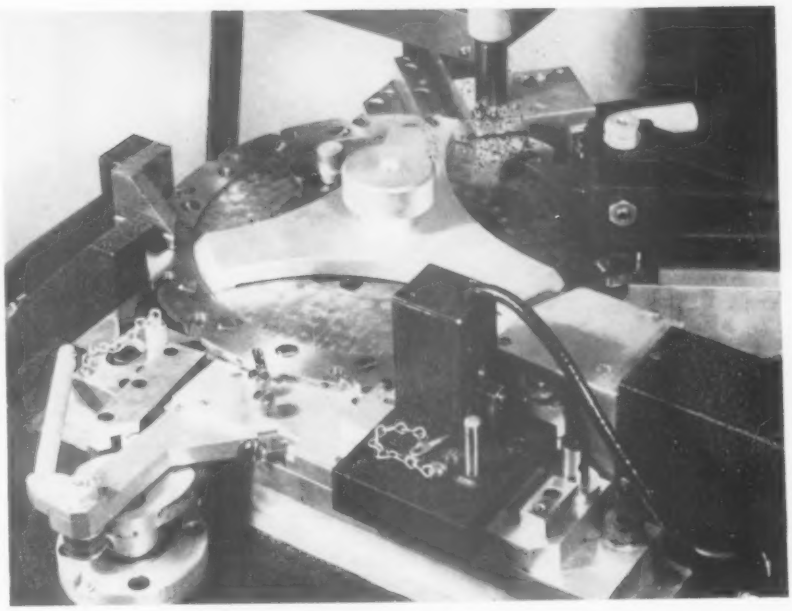


Fig. 10. This rivet sorter and gage handles five sizes of rivets, automatically sorting them into classifications 0.0001 in. apart for diameter. It handles 3800 rivets an hour, checking them for length and diameter tolerances.

rolls. These movements of the gage rolls activate electrical circuits which greatly magnify the variations for presentation on an indicating meter. This presentation shows the exact amount of variation from the gage setting. The operator can then correct the mill setting without slowing down the mill. The gage is also easily adaptable for measuring wire by the addition of an attachment.

Built-In Inspection

Shown in Fig. 9 is a transfer machine made by the W. F. and John Barnes Co. which incorporates two automatic inspection stations. The machine is a 27-station progress-through type for drilling, tapping and reaming various holes in the ends of a six-cylinder engine block. The machine is provided with two inspection stations and two blowout units. These inspection plates are slidably mounted on hardened and ground round steel bars. The plates have pins for checking the tapped holes for depth.

In the event that the holes are not drilled to depth, a limit switch is tripped, lighting a signal lamp on the panel, and also stopping the machine at the end of the cycle, so that the operator will be sure to check the block and change the broken tool or fix the tool that has not drilled to the proper depth. When checking the oil gallery hole, a jet of air is used for blowing out the chips.

Piston Pin Gage

Illustrated in Fig. 10 is an entirely automatic piston pin checking machine. The machine is self-contained, has no outside bins or racks, and does not depend on manual sorting of any kind. The pins can be fed to the machine directly from a centerless grinder on which they are produced with no intermediate handling. The sorting machine can be so timed that it will handle the number of pins which the grinder can produce.

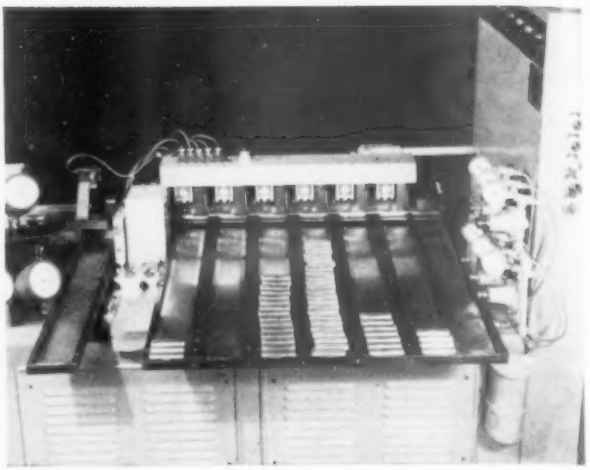
The machine, made by Merz Engineering Co., checks the pins for hardness in the first station, using a scleroscope, coupled with an electronic unit which automatically rejects or accepts the parts. Rejected parts are ejected in the next station through a chute in the back of the machine. The second station checks the surface finish using a Pico surface finish comparator. In the third station, pins are checked for length, and in the fourth station for out-of-round. In the out-of-round station, the pins are spun through two complete revolutions in a carbide V built into the feed track. Pins that are out-of-round more than 0.0001 in. are automatically ejected at this station.

In the fifth station, pins are gaged for taper using two electronic pick-up heads at the extreme ends. Any taper condition exceeding 0.0001 in. causes the pins to be rejected. The sixth and last station is for checking diameters and it also sorts the pins into three classifications within the specified tolerances and also into oversize and undersize bins.

Another similar machine which is completely automatic also sorts and gages piston pins. This machine using air gaging as provided by Airlectric heads is made by the Sheffield Corp. Here also the pins are fed directly to the gage and sorting machine by a conveyor. At the first stop, there is an excessive oversize reject station. Then the pins are presented to one Airlectric head which checks for taper, and immediately afterwards to three of the heads for diameter checking. The heads in turn actuate solenoids which raise and lower the chutes for a set of trays into which the pins are sorted. At the rate of 2600 an hour, the machine will classify into five acceptable sizes differing by 0.0001 in. and into oversize and undersize trays. This machine is shown on the cover and in Fig. 11.

Rivet Sorter

A machine developed to sort and check small parts is shown in Fig. 12. Developed by Merz Engineering Co., it is designed to check five different rivets used to assemble rotor discs for a jet engine. The machine is hopper-fed and will handle approximately 3600 rivets



Figs. 11 and 12. Two machines for sorting and gaging automotive piston pins shown here both operate automatically. The pins are fed into the machines by conveyor direct from the grinders and are then measured and classified. The machine at the left uses chutes for disposal rather than trays as at the right.

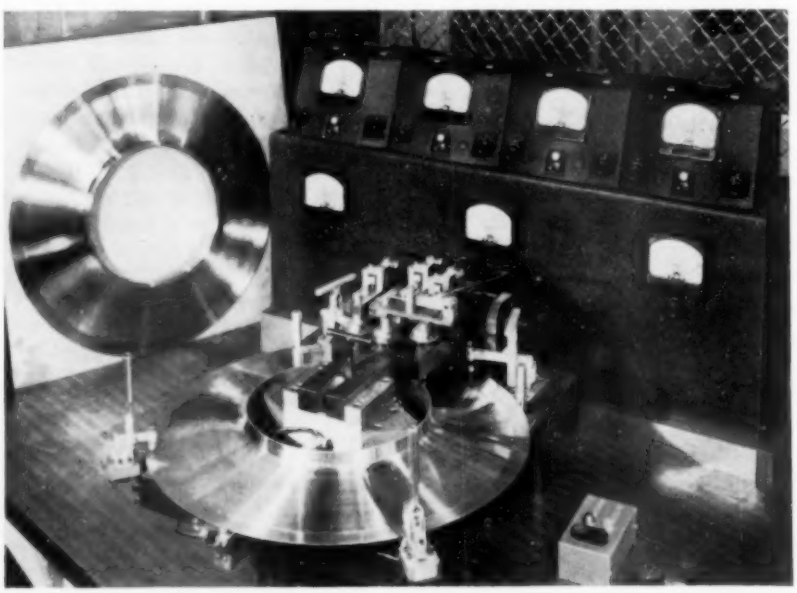
per hour. It sorts them into three classifications within the drawing tolerance and also checks the head thickness and over-all length. Oversize and undersize rivets are separated and rejected. All measuring heads are entirely electronic.

Future Applications

The first cost of automatic or continuous type gages is high, but where it has been possible to engineer an installation, the results have more than justified the expenditure. This is true not only on a cost basis, but also because of the increased quality of the product.

The foregoing examples of more or less typical installations will indicate the type of product which has been most adaptable to this kind of inspection and gaging. However, as the gage makers increase the variety of measuring devices, it will no doubt be possible to handle many other pieces of equipment which at present do not seem adaptable.

This gage is made to check rotor discs for jet engines. The electronic part of the gage is made of standard stock parts. The gage checks contour, thickness, the relation of the outer edge to the flange, the diameter of the bore, the outside diameter and by turning the discs, checks the runout of the OD with the bore and any variation in flange thickness on any runout that may be in the bore flange end. All measurements are made in one operation and the gage is set from masters.



Acknowledgments

Brown & Sharpe Co.
Federal Products Corp.
Merz Engineering Co.
Sheffield Corp.
Westinghouse Electric Corp.

References

"Continuous and Automatic Gaging," by A. C. Sanford. ASTE 19th Annual Meeting, 1951

"Essentials of Air Gaging," by W. Fay Aller, *American Machinist*, Jan. 2, 1947

Cover

An automatic gaging and sorting machine for automotive piston pins. The Sheffield Corp.

Another Tool Engineering Report will appear in September issue. *The Tool Engineer.*

Directory of ASTE Chapter Chairmen

AKRON No. 47
Third Tuesday
Allison Orvis Hunt, 124 N. Harmony St., Medina, O. Phone: 2-4332

ALBUQUERQUE No. 93
First Friday
Jerome F. Durrie, 3350 48th Loop, Sandia Base, Albuquerque, N.M. Phone: 5-5511, Ext. 3-3193

ATLANTA No. 61
Third Monday
Frank Frost Ford, 67 The Prado, N.E., Atlanta 5, Georgia. Phone EMerson-2153

BALTIMORE No. 13
First Wednesday
Leon E. Laux, 900 E. Fairway Dr., Towson 4, Maryland. Phone: Towson-0315

BINGHAMTON No. 35
First Wednesday
William A. Leindecker, 42 Orchard Ave., Johnson City, New York. Phone: 7-2082

BOSTON No. 33
Second Thursday
Harold L. Seekins, 17 Ridge Rd., Marblehead, Mass. Phone: Marblehead-3196-M

BUFFALO-NIAGARA No. 10
Second Thursday
William L. Clarke, Ex-Cell-O Corp., 923 Kensington Avenue, Buffalo 15, New York. Phone: PArkside-5202

CEDAR RAPIDS No. 71
Third Wednesday
Edwin Klouda, Sixth & Prairie Ave., S.W., Cedar Rapids, Iowa. Phone: 3-2522

CENTRAL PENNSYLVANIA No. 22
First Monday
Burnell C. Stambaugh, Hanover Tool & Specialty Works, 449 York St., Hanover, Pa. Phone: 3-3240

CHICAGO No. 5
Second Tuesday
H. Verne Loeppert, 9925 Karlov Ave., Skokie, Ill. Phone: Skokie-4912

CINCINNATI No. 21
Second Tuesday
Joseph Aprile, 3715 Brotherton Rd., Cincinnati 9, Ohio. Phone: ME 2943

CLEVELAND No. 3
Second Friday
A. B. Clark, Haynes Stellite Company, 1517 Superior Ave., Cleveland 14, Ohio. Phone: CH 1-5366

COLUMBUS No. 36
Second Wednesday
Jack E. Mitchell, 344 South Brinker Ave., Columbus 4, Ohio. Phone: Randolph-2971

DAYTON No. 18
Second Monday
Richard M. Blair, 7406 Harry Truman Drive, Dayton 3, Ohio. Phone: OL 4902

DECATUR No. 58
Last Tuesday
Fred W. Sobottka, 1620½ E. Cleveland, Decatur, Ill. Phone: 9564

DENVER No. 77
First Wednesday
F. J. Geoffroy, The Geoffroy Company, P. O. Box 67, Capitol Hill Sta., Denver 6, Colorado. Phone: Fremont-8188

DES MOINES No. 80
Third Wednesday
Howard E. Campbell, 2733 Adams Ave., Des Moines 10, Iowa. Phone: 7-9381

DETROIT No. 1
Second Thursday
Edward D. Wiard, Illinois Tool Works, 2895 E. Grand Blvd., Detroit 2, Mich. Phone: Trinity 4-1880

ELMIRA No. 24
First Monday
Raymond F. Banfield, 134 Catalpa Drive, Horseheads, N.Y. Phone: Horseheads-859-M

ERIE No. 62
First Tuesday
Walter S. Cebelinski, 320 East 31st St., Erie, Pa. Phone: Erie 04-308

EVANSVILLE No. 73
Second Monday
Henry J. Pernicka, 4617 Taylor Ave., Evansville, Ind. Phone 6-0622

FAIRFIELD COUNTY No. 6
First Wednesday
Mason B. Whiting, Box 12, Redding Ridge, Conn. Phone: Redding-94

FOND DU LAC No. 45
Second Friday
Paul V. Rohling, Vollrath Company, 1236 N. 18th St., Sheboygan, Wisc. Phone 4851

FORT WAYNE No. 56
Second Wednesday
Everett R. Keese, Bowser, Inc., 1302 E. Creighton Ave., Fort Wayne 2, Ind. Phone: H-2341

FOX RIVER VALLEY No. 72
First Tuesday
George R. Parsons, 486 Ann St., Elgin, Ill. Phone: Elgin-5692

GOLDEN GATE No. 28
Third Wednesday
Ted J. Rohrer, Pratt & Whitney Div., 1331 Howard St., San Francisco 3, Calif. Phone: MArket 1-7363

GRAND RIVER VALLEY No. 81
First Friday
David E. McCready, 19 St. Arnaud St., Guelph, Ontario, Canada. Phone: 3674

GRANITE STATE No. 86
Second Tuesday
James David Wilson, 18 Carisbrooke St., Andover, Mass. Phone: Andover 188-J

HAMILTON No. 42
Second Friday
William McKee Shaw, 9 Harrison Ave., Guelph, Ontario, Canada. Phone: 2291-R

HARTFORD No. 7
First Monday
Henry E. Kuryla, Norden Instruments, Inc., Wiley St., Milford, Conn. Phone: 2-6721, Ext. 213

HOUSTON No. 29
Second Tuesday
George L. Freeman, Steel & Machine Tool Sls. Co., P. O. Box 1716, Houston 1, Texas. Phone: WA 7113

INDIANAPOLIS No. 37
First Thursday
Denis F. White, 1222 E. New York St., Indianapolis 2, Ind. Phone: Franklin 3196

JACKSON No. 87
Third Monday
Edwin G. Small, Dawlen Corp., 1911 Fargo Rd., Jackson, Mich. Phone: 7137

KANSAS CITY No. 57
First Wednesday
John W. Hoover, 3212 Jefferson St., Kansas City 2, Mo. Phone: Logan 1435

LaCROSSE No. 96
Fourth Tuesday
John David Holly, 220½ 19th St., LaCrosse, Wisc. Phone: 2-4688

LANCASTER, GREATER No. 89
Second Tuesday
Willis M. Houck, 54 Union St., New Holland, Pa. Phone: New Holland 4-8262

LEHIGH VALLEY No. 83
Third Friday
John Eaton, 408 North 26th St., Allentown, Pa., Phone: Allentown 2-7224

LIMA No. 97
Third Thursday
R. J. Schimpf, 842 W. Elm, Lima, Ohio. Phone: 7-5623

LITTLE RHODY No. 53
First Thursday
Matthew J. Grochmal, 82 Bryant St., No. Dartmouth, Mass. Phone: JA 1-2053

LONDON-ST. THOMAS & DIST. No. 91
Third Thursday
Albert H. Ward, 48 Apeldoorn Crescent, London, Ontario, Canada. Phone: 3-5601-R

LONG BEACH No. 84
Second Wednesday
Frank D. Wallace, 2906 Petaluma Ave., Long Beach 4, Calif. Phone: 50778

LONG ISLAND No. 88
Second Monday
William W. Rogers, L. I. Agr. & Tech. Inst., 520 Conklin St., Farmingdale, L. I., N. Y. Phone: Farmingdale 2-2506

LOS ALAMOS No. 92
1st Thurs. after 1st Wed.
Norman C. Blezek, 3226-A Walnut St., Los Alamos, N. M. Phone: 2-2119

LOS ANGELES No. 27
Second Thursday
Ralph Louis Chrissie, Hollywood Mfg. & Sup. Corp., 720 Towne Ave., Los Angeles 21, Calif. Phone: TR 7061

LOUISVILLE No. 54
Second Tuesday
Robert F. Stucker, 3211 Oriole Drive, Louisville 13, Ky. Phone: MA 5-953-W

MADISON No. 75
Second Tuesday
Charles W. Neff, 2321 Kendall Ave., Madison 5, Wisc. Phone: 3-1583

MID HUDSON No. 74
Second Tuesday
Joseph A. Crane, Intn'l Business Mach. Corp. Engineering Laboratory, Box 390, Poughkeepsie, N. Y. Phone: 6920, Ext. 591

MILWAUKEE No. 4
Second Thursday
Waldemar E. Klein, 7624 West Walker St., Milwaukee 14, Wisc. Phone: Greenfield 6-2737

MOHAWK VALLEY No. 78
Fourth Tuesday
Albert Charles Delmont, 812 Arnold Avenue, Utica 2, N. Y. Phone: 2-2907

MONTREAL No. 50
Second Thursday
Creighton Joseph McDowell, 5020 Randall Ave., Montreal 29, Quebec, Canada. Phone: DExter 3071

MUNCIE No. 70
First Tuesday
Lake Lavon Deane, 2005 S. Hackley, Muncie, Ind. Phone: 5-226

NASHVILLE No. 43
Third Tuesday
John W. Gipson, 610 Shady Lane, Nashville 6, Tenn. Phone: 3-5673-W

NEW HAVEN No. 41
Second Thursday
John H. Alton, Eastern Machine Screw Corp., Truman & Barclay Sts., New Haven 10, Conn. Phone: 7-5724

NEW ORLEANS No. 60
First Tuesday
James R. Cypher, Chrysler Corporation, P. O. Box 460, New Orleans, Louisiana

NEW YORK, GREATER No. 34
First Monday
Eugene Roth, Eugene Roth Co., Inc., 250 West 57th St., New York 19, N. Y. Phone: Plaza 7-8470

NIAGARA DISTRICT No. 65
First Thursday
John Michael Marchyn, Tri-Sure Prod. Ltd., 264 Welland Ave., St. Catharines, Ontario, Canada. Phone: MU 5-8475

NORTH TEXAS No. 51
Last Friday
Arnold E. Unruh, 708 Roberts Cutoff, Fort Worth 14, Texas. Phone: PE 5807

NO. NEW JERSEY No. 14
Second Tuesday
Clyde C. Shannon, 1508 Burnett Ave., Union, N. J. Phone: Union 2-6648-R

PEORIA No. 31
First Tuesday
William H. Logue, 3018 Springfield Rd., E. Peoria 8, Ill. Phone: 3-4070

PETERBOROUGH No. 94
First Thursday
Robert R. Dyer, 247 Wilson, Peterborough, Ontario, Canada. Phone: 2-4453

PHILADELPHIA No. 15
Third Thursday
Albert B. Luecke, 622 Bover Rd., Cheltenham, Pa. Phone: Cheltenham 8005

PIEDMONT No. 82
Second Monday
Charles J. Rix, 828 Melrose St., Winston-Salem, N. C. Phone: 4-1845

PITTSBURGH No. 8
First Friday
Fred Hennig, Jr., Kennametal, Inc., 600 Grant St., Pittsburgh 19, Pa. Phone: AT 1-4543

PONTIAC No. 69
Third Monday
Ronald J. Hayward 231 Starr St., Pontiac 18, Mich. Phone: FE 2-8909

PORTLAND, ME. No. 46
Second Friday
John J. Green, Thomas Laughlin Company, 143 Fore St., Portland 6, Maine. Phone: 3-1791

PORTLAND, ORE. No. 63
Third Thursday
Daniel I. Melody, 4727 N. E. 74 Ave., Portland 13, Ore. Phone: TR 7054

POTOMAC No. 48
First Thursday
William E. Jones, U. S. Naval Gun Factory, 8th & M Sts., S. E., Washington, D. C. Phone: Fr 5700, Ext. 2193

RACINE No. 2
First Monday
John George Obermeyer, R 3, Box 176, Racine, Wisc. Phone: 2-3886

RICHMOND No. 66
Second Tuesday
James C. Brindell, 408 So. 23rd St., Richmond, Ind. Phone: 7-1721

ROCHESTER No. 16
First Monday
Charles L. DeMartin, General Screw Products Corp., 63 Mt. Hope Ave., Rochester, N. Y. Phone: Hamilton 6750

ROCKFORD No. 12
Second Thursday
Bruce H. Lundgren, Sundstrand Machine Tool, 2531 11th St., Rockford, Ill. Phone: 24477

SAGINAW VALLEY No. 68
Third Thursday
Clyde L. Fanning, 3128 Norwood Drive, Flint 4, Mich. Phone: 9-5160

SAN GABRIEL VALLEY No. 95
First Thursday
Edw. A. Smith, Day & Night Mfg. Co., 700 Royal Oaks, Monrovia, Calif. Phone: Elliott 8-3211

ST. LOUIS No. 17
First Thursday
Erwin Paul Huchzermeier, 4934 Miami St., St. Louis 9, Mo. Phone: Flanders 1567

SALT LAKE CITY No. 85
First Friday after first Wednesday
John F. Woodhead, 2477 Skyline Drive, Salt Lake City 5, Utah. Phone 8-3162

SAN DIEGO No. 44
Second Tuesday
Arthur E. Crom, 1759 Oliver Ave., San Diego 9, Calif. Phone: H 8-2682

SCHENECTADY No. 20
Second Thursday
A. Edmund Lee, Box 1151, Scotia 2, N. Y. Phone: Burnt Hills 6121

SEATTLE No. 39
Fourth Tuesday
A. J. Gembolis, 4501 Greenwood Ave., Seattle 3, Wash. Phone: HE 5919

SOUTH BEND No. 30
Second Tuesday
Lawrence Haverstock, 2515 Mishawaka Ave., South Bend 15, Ind. Phone: 3-1063

SPRINGFIELD, ILL. No. 64
First Tuesday
Robert C. Peek, 541 South Lincoln, Springfield, Ill. Phone: 2-8516

SPRINGFIELD, MASS. No. 32
Second Monday
William F. Buckley, 142 Chapin Terr., Springfield, Mass. Phone: 3-2567

SPRINGFIELD, OHIO No. 76
Second Tuesday
Kenneth A. Forsell, 324 Ogden Rd., Springfield, Ohio. Phone: 3- 2738

SYRACUSE No. 19
Second Tuesday
Albert C. Vesper, 419 Durston Ave., Syracuse 6, N. Y. Phone: 74-3130

TOLEDO No. 9
Second & fourth Wednesday
Elmer L. Faber, 4162 Berwick, Toledo 12, Ohio. Phone: Kingswood 1007

TORONTO No. 26
First Wednesday
Fred J. E. Lockhart, Atlas Steels Ltd., 30 Ordnance Street, Toronto, Ontario, Canada. Phone: EMpire 4-2431

TRI-CITIES No. 23
Second Wednesday
Gilbert H. Jording, 2015 42nd St., Rock Island, Ill. Phone: Rock Island 6-6039

TULSA No. 90
Second Thursday
John H. Keyes, 1342 South Norfolk, Tulsa 14, Okla. Phone: 4-5963

TWIN CITIES No. 11
First Wednesday
Don Reiner, 5328 Bloomington, So. Minneapolis 7, Minn. Phone: PL 6973

TWIN STATES No. 40
Second Wednesday
Robert Wm. Laffin, Laffin Supply Corp., 22 Commonwealth Ave., Springfield, Vt. Phone: 2597

WATERLOO AREA No. 79
Fourth Wednesday
David D. Lowber, 1321 Brooklyn Ave., Ann Arbor, Mich. Phone: 2-7916

WESTERN MICHIGAN No. 38
Second Monday
Robert J. Maguire, Good Steel Service, Inc., 1010 Leonard St., N. W., Grand Rapids, Mich. Phone: 9-0213

WICHITA No. 52
Second Wednesday
Orville B. Strahm, 601 S. Terrace Dr., Wichita 9, Kans. Phone: 6-1706

WILLIAMSPORT No. 49
Second Monday
Morris C. Smith, 198 Broad St., Montoursville 1, Pa. Phone: 8-1114 (Williamsport)

WINDSOR No. 55
Second Monday
David C. Heath, 460 Sunset Ave., Windsor, Ontario, Canada. Phone: 3-6135

WORCESTER No. 25
First Tuesday
E. Roland Ljungquist, 37 Winifred Ave., Worcester 5, Mass. Phone: 3-8362

National officers of ASTE present at the Dallas meeting were, from left: H. E. Collins, secretary; H. C. McMillen, treasurer; J. O. Horne, program committee chairman; L. B. Bellamy, Society president; Gardner Young, past chairman of the program committee; J. P. Crosby, second vice president and W. G. Ehrhardt, director-elect.

South West Area Meeting Held May 30-31

T. E. Braniff, Air Line President, Addresses ASTE Banquet

By Nancy L. Morgan

Spring activities of ASTE members from nine south western chapters were sparked by a two-day area meeting held May 30-31 at the Baker Hotel in Dallas, Texas. A complete program of plant tours, technical sessions, membership and chapter officers' meetings, a panel discussion and a banquet was offered to some 80 representatives of the Houston, Wichita, Denver, Tulsa, North Texas, Kansas City, New Orleans, Los Alamos and Albuquerque ASTE chapters.

National officers of the Society attending the area meeting were: President L. B. Bellamy, Second Vice President J. P. Crosby, Secretary H. E. Collins, Treasurer H. C. McMillin, Director-elect W. G. Ehrhardt, Gardner Young, immediate past chairman of the national program committee and J. O. Horne, present chairman of the program committee. R. J. Bacik represented national headquarters.

Banquet Program

More than 125 members and their guests were present for the ASTE banquet held in the Peacock Terrace at the hotel. Principal speakers at the event were President Bellamy and T. E. Braniff, president of Braniff International Airways.

The development of trade with South America was the topic covered by Mr. Braniff. He discussed how a greater understanding between the two contitents has been developed through increased travel (500 percent since 1931), interchange of scholarships and increased trade.

W. E. Kramer

W. R. Plummer

After congratulating the area committee for its organizational work on the meeting, Mr. Bellamy spoke on the all-important function of the tool engineer and ASTE activities.

"Our wealth is dependent on our ability to produce more and more in less time and with less physical effort," he said, "and through the tool engineer the present standard of living can be raised more than 200 percent in the next 25 to 30 years."

He stated that the surprise shown by visitors from other countries when they see American industry at work and the advances made through cooperation by one industry with another points up the increasing importance of ASTE.

T. E. Braniff

Technical audiences heard Mr. Kramer and Mr. Plummer. T. E. Braniff spoke to more than 125 members and guests at the banquet at the Baker Hotel.

Three Technical Sessions

Technical sessions featured three papers presented by Byron Nierenberg, sales engineer, Loewy-Hydropress Co., Inc.; W. E. Kramer, Gulf Research & Development Corp.; and W. R. Plummer, general sales manager, Progressive Welder Co.

Mr. Nierenberg spoke on "Marform for Flexible Aircraft Pressworking," Mr. Kramer's topic was "Hi-Jet System of Lubrication for Metal Turning," and Mr. Plummer discussed "Resistance Welding as a Production Tool." Question and answer periods were featured at all three sessions.

Plant Tours

Plant tours attracted nearly 50 persons. On the visitation program for the area meeting were an aircraft plant and the Murray Co. of Texas.

The panel discussion on metal-forming was moderated by J. A. Lapham, process engineer, Consolidated Vultee Aircraft Corp., and six other ASTE members representing various fields in metal-working.

Other participants were: Prof. M. L. Begeman, Mechanical Engineering Dept., University of Texas, representing educational and theoretical point of view; H. A. Jacobs, chief engineer, Vernon Mfg. Co., Dallas, representing press manufacturers' views; J. W. Thompson, Haynes Stellite Co., Kokomo, Ind., representing investment casting field; John Hall, vice president, Wheel-Craft Corp., Azusa, Calif., representing manufacturing methods for low cost production; F. E. Zimmerman, tool engineer, Consolidated Vultee Aircraft Corp., Fort Worth, representing metal-forming developments and aircraft manufacturers' practice; and J. W. Mitchell, vice president, Rupert Die-casting Co., Kansas City, Mo., representing die casting field.

Questions and Answers

A discussion period, in which selected questions were answered, supplemented the more formal part of the session.

The new Westinghouse Electric Corp. science show, "Energy in Action," was featured at the meeting and attracted many interested visitors.

The membership meeting, conducted by President Bellamy, and the chapter officers' meeting, conducted by Secretary Collins, provided opportunities to more than 50 members to discuss chapter operation and national headquarters procedures.

Ladies' Activities

Ladies' activities at the two-day ASTE gathering included a conducted tour of the famed Neiman-Marcus store and a luncheon and ice show at the Adolphus Hotel.

The area meeting held in Dallas was the second meeting of its type to be staged by the Society. A similar one was held the latter part of October, 1951, in Evansville, Ind. In addition to the plant tours, technical sessions, and membership meeting, the Evansville event also included the semi-annual meeting of the board of directors.

Committee chairmen who helped organize the area meeting in Dallas and make the necessary arrangements are: V. V. Koodroff, general chairman; Fred Bates, technical sessions; Jay Franklin, plant tours; Chuck Stevens, transportation; Irving Buck and Lee Shetler, banquet and entertainment; Jack Vanderweel and M. W. Smeal, reception; J. A. Lapham, E. L. Minch and B. H. Greene, publicity.

Session arrangements and signs were handled by Roy Jones and Wallace Enman. W. P. Flynn and A. E. Unruh were in charge of budgets and reports, tickets were handled by V. Contrucci and ladies' activities were under the direction of Mrs. John Turvene and Mrs. Unruh.

President Bellamy answers a question offered at the membership meeting. The informal discussion session provided opportunity for airing questions on chapter operation and procedures. This meeting and a similar one held for chapter officers attracted an attendance of about 50 persons. Pictured here, from left: J. O. Horne, national program chairman; H. E. Collins, secretary; Mr. Bellamy and H. C. McMillen, ASTE treasurer.

Byron Nierenberg, right, is introduced by session chairman Fred Bates. Mr. Nierenberg, sales engineer, Loewy-Hydropress Co., spoke on "Marform for Flexible Aircraft Pressworking."

Moderator John Lapham directs a question to a member of the panel on metal-forming. Also shown, from left, are: H. A. Jacobs, chief engineer, Verson Mfg. Co.; J. W. Thompson, Haynes Stellite Co.; Prof. M. L. Begeman, Mechanical Engineering Dept., University of Texas; J. W. Mitchell, vice president, Rupert Diecasting Co.; F. E. Simmerman, tool engineer, Consolidated Vultee Aircraft Corp.

More than 20 executives and officials of the Arma Corp. were dinner guests of the Greater New York ASTE chapter at the group's meeting held on May 12.

New York Chapter Holds Arma Corp. Night

New York City — The evening of May 12 was designated as "Arma Night" by members of the Greater New York chapter of ASTE who met in the Grand Ballroom of the Hotel New Yorker to hear a program presented by executives of the Arma Corp., subsidiary of American Bosch Corp. A large attendance from the chapter and more than 20 Arma representatives were on hand for dinner and the technical session on "Automation of Machines and Processes—the Newer Techniques of Automatic Control."

The technical papers that were presented covered the fundamentals and recent advances in servomechanism development and the steps now being taken to bring the "hardware" of automatic controls within the reach of a larger segment of American industry.

MR. FRASER

MR. KAPLAN

Speakers were Julius Y. Kaplan and Lee Fraser, respectively head of the Servo Section and production manager of Arma Corp.

Mr. Kaplan demonstrated the principle involved in the use of servomechanisms now being made for Navy fire control, for surface cutting and for non-circular gear cutting. He said that the same devices, powered electronically, could be used for tool changes, improved quality control systems, materials handling and chemical processing.

A description of the company's plans to manufacture rotating components on a mass production basis in a new plant at Mineola, Long Island, was given by Mr. Fraser.

"When production gets under way," he said, "the cost of the rotating components will be substantially reduced and the units will be available eventually for installation in servomechanisms for civilian industry."

He emphasized that tool engineers, with the aid of control equipment soon to come within reach of a large segment of American industry, are in a position to start at once in planning for the automation of many industrial machine operations and processes.

The rotating components described by the Arma officials are essential elements in devices which would be linked with electronic computers, more familiarly known as "electronic brains," in some of the more complex applications for which they are intended.

A feature of the meeting was the presentation of a *Tool Engineers Handbook* to Robert Frechman, ASTE member with the Arma Corp., for his winning question submitted for panel discussion at the Annual Meeting in Chicago.

Earlier in the day, a press conference and luncheon was held for more than 42 writers and editors. The speakers for the evening outlined their lectures and Past Chairman Holbrook Horton spoke on ASTE. Arma officials were introduced by Chairman Eugene Roth who also presented First Vice Chairman Arthur Smedley, Second Vice President Murray Ehrenhaus and Miss Idalyn R. Cohen, public relations chairman. Past Chairman Ed Galvin explained the purposes of "Arma Night" and gave special thanks to Mr. Frechman and the Arma Corp. for their work and excellent program.

Bellamy Addresses Dayton ASTE Chapter

Dayton—A speech by National ASTE President L. B. Bellamy highlighted the 1952 anniversary meeting of the Dayton chapter held May 12 at the Miami Hotel. Also honored at the dinner meeting were all past chairmen and chapter members of the chapter who were seated at special tables placed near the speakers' table.

President Bellamy pointed out in his address the several Dayton members of the Society who have gained national prominence.

A talk on "Europe Today" was given by Herb Eikenbary, Dayton attorney recently returned from a trip to the Continent. He took his audience on a rapid-fire visit through the old countries, giving little-known side lights of each. A question-and-answer period was included in his portion of the program.

Several performers entertained the membership immediately after dinner.

A tour of the Hobart Mfg. Co., Troy, Ohio, reportedly the world's largest manufacturers of electrical food and kitchen machines, was attended by more than 100 members. A luncheon was served by the company on the conclusion of the visitation.

Kinney with NPA

George R. Kinney, member of the Mid-Hudson ASTE chapter, is on leave of absence as sales manager of the V & O Press Co., division of Emhart Mfg. Co., to serve as chief of the Forge and Press Section, Metalworking Equipment Div., National Production Authority.

Robert Frechman (third from left) is presented a *Tool Engineers Handbook* by Chairman Eugene Roth. Pictured with them are Jay Wohlfeld, secretary, and Murray Ehrenhaus, second vice chairman.

ASTE officers of the Lima, Ohio, chapter are pictured with National President L. B. Bellamy at the installation ceremonies. From left: Treasurer W. J. James, Secretary H. W. Carey, Second Vice Chairman R. E. Fromson, Mr. Bellamy, First Vice Chairman A. E. Feightner and Chapter Chairman R. J. Schimpf.

National Officers Charter 97th Chapter

The ever-growing roster of ASTE chapters pushed closer to the one hundred mark on May 15 when the 97th chapter was chartered in Lima, Ohio. The chartering ceremonies, held at a dinner meeting in the East Room of the Barr Hotel, were witnessed by more than 125 members, guests and national officers.

Charter officers of the chapter were installed by National President L. B. Bellamy who administered the oath of office to: R. J. Schimpf, chairman; A. E. Feightner, first vice chairman; R. E. Fromson, second vice chairman; H. W. Carey, secretary; and W. J. James, treasurer.

Congratulates Chapter

National Director W. B. McClellan gave a congratulatory address to the charter officers and members and presented the charter to Chairman Schimpf.

The installation program was conducted by Harry E. Conrad, executive secretary of the Society, who spoke briefly on the technical value that members derive through affiliation with ASTE.

Complimenting the membership on its outstanding job in organizing the chapter, A. B. Clark, chairman of the national membership committee, presented the new membership kit to R. E. Fromson.

Technical Program

Technical speaker for the evening's program was Dr. H. B. Osborn, Jr., ASTE national director and technical director of the Tocco Div., Ohio Crankshaft Co., Cleveland. His lecture was titled "The Uses of Induction Heating."

Appointment of committee chairman in the newly-formed chapter was announced. Vince Spahr will head the constitution-and-by-laws committee; William E. Epley is chairman of the membership committee; G. L. Runkle was named standards chairman; J. E. Kuck is chairman of the program committee; R. T. Mercer was appointed public relations chairman; D. F. Filter is head of the education committee; and William Lore is editorial chairman.

Industry in Lima and the surrounding area has shown its recognition of the tool engineer and the strength offered by affiliation with ASTE by the support of Westinghouse Electric Corp., Superior Coach Corp., Baldwin-Lima-Hamilton Corp., Ohio Steel Foundry, Avco Corp., Lennox Furnace Co., Ex-Cell-O Corp., Neon Products and several smaller firms.

Among the visitors at the charter meeting were Ray C. Peterson, head of the national standards committee; Dale H. Burke, membership area captain; Allan Ray Putnam, assistant executive secretary of ASTE; Kenneth A. Forsell, Springfield chapter chairman; Owen Harvey, Cleveland member; A. M. Schmitt, Toledo member; Chet Parks, Pittsburgh member; Joseph E. Charters, Springfield member; C. C. Hartwig, Toledo public relations chairman; Frank J. Manning, Ft. Wayne member; Robert W. Graham, Springfield member; Marvin Bunting and Cal Burke of the national ASTE headquarters staff.

W. B. McClellan, a national director of ASTE, presents the Lima charter to Chairman Schimpf.

ASTE Roster

Members of the Lima chapter are: Edwin L. Ansley, Michael Berthold, Fred Bice, Bernard G. Bishop, Francis W. Blosser, John T. Botkin, Wilbur A. Brillhart, Earl J. Bruns, Harry S. Clark, Ralph H. Coder, Israel M. Cramer, Herbert R. Crane, James I. Day.

Theodore E. DeVries, Francis E. Donathan, Clarence E. Estill, Charles E. Gaffney, Paul E. Gifford, Everett C. Gilbert, John B. Gobin, Robert B. Gossett, H. E. Grant, Ralph D. Hall, George L. Hartman, H. J. Hawk, Vernon C. Hennon.

Hugh E. Hilty, Richard B. Houtzer, Robert S. Johnston, Werner A. Kachel, G. W. Kimmel, James H. Koch, Herbert P. Kunkleman, Gerald O. Lincoln, Milton A. Logan, Harry E. Marietta, Donald J. McCain, James R. McCown, G. Kenneth McKee, Frank S. Miller, Charles M. Modd, Otho R. Moore, Lloyd A. Naas, Donald J. Nichelson, Melvin L. Niece.

More Members

Rex V. Nutter, Edward A. Parent, Milton R. Parent, John K. Parshall, Franklin L. Pauff, Emerson T. Paul, Amos J. Place, John L. Rentz, Jack K. Riddle, John K. Robertson, Ray R. Runser, Donald F. Sarber, Alfred L. Sawyer, Howard H. Schroeder, Delmar W. Schulze, Wade E. Siler, Russell L. Smith, Andrew Sousz, Gene D. Stemen.

Cyril N. Sterrett, Raymond S. Strayer, Superior Coach Corp., Dearella A. Sweet, Otto I. Taflinger, Russell A. Tarlton, Eugene G. Tomlinson, Emerson R. Trobaugh, Fred B. Tschanz, Floyd J. Van Pelt, Eugene R. Wagner, James B. Walsh, Jr., Lewis S. Ward, Wilbur E. Waters, Omar L. Welty, Fred C. Wiesenmayer, and Jack G. Witham.

Honor Executives at Connecticut Night

New Haven—Plant tours of five New Haven companies, a technical lecture by the historian of Olin Industries, and a speech by the president of the Taft-Peirce Mfg. Co. played leading roles in the success of the fourth annual Connecticut Night held on May 16.

Host chapter for the event was the New Haven organization, with the Hartford and Fairfield County chapters participating. Total attendance was well over 300 members and guests.

Activities began at 1 p.m. when Sargent & Co., U. S. Electrical Motors, Eastern Machine Screw Corp., Greist Mfg. Co. and Detroit Steel Co. were opened for ASTE visitation.

About 60 persons heard Thomas E. Hall speak on "The Development of the Rifle in America." A collection of old and modern-day Winchester rifles was exhibited at the session. The speaker was introduced by Ralph E. Clarkson, research engineer, Winchester Repeating Arms Co.

A social hour was held before the banquet. Fred J. Dawless acted as toastmaster and introduced the guests seated at the speakers' table: Max Baker, president, Majestic Silver Co.; Walter H. Voos, president, Voos Co.; Charles Costello, president, C. Cowles & Co.; H. M. Greist, vice president, Greist Mfg. Co.; Carl Bettches, president, Eastern Machine Screw Corp.

Also at the head table were: Fred Syminton, president, National Folding Box & Paper Co.; Forbes Sargent, president, Sargent & Co.; A. W. Wilkenson, vice president, Ansonia Branch, American Brass Co.; Paul Hershey, president, Hershey Metal Products; Henry Jones, chief engineer, American Tube Bending Co., Inc.; James Hartley, director of research, Winchester Repeating Arms; W. O. Ross, executive secretary, Mfg. Div., New Haven Chamber of Commerce; John H. Alton, chairman, New Haven chapter; Henry E. Kuryla, chairman of Hartford chapter; Mason Whiting, chairman of Fairfield County chapter; Ray H. Morris, past national president of ASTE; and Roger F. Waindle, first vice president of ASTE.

Mr. Waindle greeted the members and guests at the gathering in behalf of the chapter presidents.

A short speech was presented by Dr. Finis Engleman, commissioner of education for the state of Connecticut, who was representing the governor at the meeting. He spoke on the progress of the 12 state trade schools.

Mayor William Celentano welcomed those at the banquet to the city on behalf of the citizens of New Haven.

F. W. Gilbert, general chairman of Connecticut Night, thanked his committee for its excellent work and then introduced Frederick Steele Blackall, Jr., president and treasurer of the Taft-Peirce Mfg. Co., Woonsocket, R. I.

Mr. Blackall addressed the group on the subject "To Make a Strong Nation Stronger."

The 1952-53 national public relations committee of ASTE held its first meeting on May 17 at national headquarters of the Society in Detroit. Shown at the all-day session (seated, from left) are: Miss Nancy L. Morgan, ASTE news editor; Harry E. Conrad, executive secretary of the Society; Leslie F. Hawes, chairman of the committee and member of the Los Angeles chapter; H. E. Linsley, Northern New Jersey chapter; George Elwers, Greater New York chapter; and R. Eric Crawford, Toronto chapter. Standing: A. F. Denham, public relations counsel; A. R. Putnam, assistant executive secretary; M. J. Bunting, national headquarters staff.

Glen Stimson Discusses Unified Screw Threads

Kansas City, Mo.—Nearly 50 members and guests of the ASTE chapter attended the May meeting and dinner held at Roselli's Restaurant.

Speaker for the evening was Glen H. Stimson, chief engineer, Gage Div., Greenfield Tap and Die Corp., whose topic was "The Development of Unified Screw Threads and Their Importance to Industry." Mr. Stimson is a member of the subcommittee working on unified gage practices and is also a member of the Pipe Thread and American Gage Design Committee.

He gave a brief outline of the history of the unified thread system, showing some of the problems encountered and some of the compromises made. Classes under the new system, which allows broader tolerances, are preceded by the letter U; hole tolerances are designated B and screw tolerances use the letter A.

A short discussion period concluded the meeting.

Executives of Connecticut industries and ASTE members from three chapters in the state met May 16 for the fourth annual Connecticut Night. Plant tours, technical sessions, a banquet and speeches by ASTE First Vice President Roger F. Waindle and F. S. Blackall, president and treasurer of the Taft-Peirce Mfg. Co., Woonsocket, R. I., attracted more than 300 members and guests of New Haven, Hartford and Fairfield County chapters.

Potomac Members Hear C. J. Oxford

Washington, D. C.—"Hobs and Hobbing Practices" was discussed by C. J. Oxford, National Twist Drill & Tool Co., in a talk before 75 members and guests of the Potomac chapter at their May 1 dinner meeting, held at the Hamilton Hotel. Visitors who supplemented ASTE ranks were representatives from the Taylor Model Basin, Naval Ordnance Laboratory, Naval Research Laboratory and Naval Gun Factory.

Mr. Oxford said "Understanding of hobbing is the greatest hurdle to further development. Users are not required to know involute layout technique, but merely have to visualize screw meshing with worm gear. Rotation and penetration produce the generated cutting action required and varying the pressure angle creates high or low bearing effects for specific purposes. Hob tooth strength is improved by dropping the pitch line of the tooth."

Most trouble encountered in hobbing, he continued, results from loose fitting equipment, poor fitting arbors and improper cutting speeds.

The following new members, all representing the Naval Gun Factory, were welcomed to ASTE at the meeting: Carl McClanahan, C. J. Roesle, J. E. Heinz, I. M. Conrad, J. B. Bluebaugh, Jr., W. K. Hampton and R. D. MacDonell.

Wichita Speaker Covers Principles of Air Tools

Wichita — About 80 members and guests of the Wichita ASTE chapter met May 14 in the banquet room of Wolf's Cafeteria for a program on "Principles and Applications of Air Tools." W. J. Vossbrinck, sales manager, Cleco Div., Reed Roller Bit Co., Houston, was the technical speaker. He was assisted by Victor Dolan, manager of the Chicago division, and George E. Bush, development engineer, who explained operating principles through the use of diagrammatic layouts.

Using charts to illustrate the various types of air motors, Mr. Vossbrinck explained that there are two basic types of air motors, the rotary and the reciprocating. A third type, also rotary, operates on the turbine principle and attains up to 100,000 rpm.

He described many applications and pointed out that tool engineers can improve efficiency of their air tools by providing shorter piping, adequate compresses capacity and by planning a distribution system which will insure constant gage pressures of at least 80 pounds.

The birthday cake, which was cut by President L. B. Bellamy and C. H. Fisher, past chairman of the chapter, was an important part of the festivities which marked the 100th meeting of the Hamilton District chapter held on April 18.

Harry Conn Addresses South Bend ASTE Chapter

South Bend — "Production Tooling Problems" was the topic discussed by Harry Conn, chief engineer of the Scully-Jones Co., Chicago, at the May 13 meeting of the South Bend ASTE chapter held at the Isaac Walton League clubhouse.

Using tapping as an example, Mr. Conn traced the steps necessary in determining the source of trouble—checking hole size, machine accuracy, speed coolant, material characteristics and many other factors.

Announcement was made at the meeting that 20 new members have been added to the chapter in the last two months.

Ladies' Night Takes Hamilton Spotlight

Hamilton, Ont.—The evening of May 9 was Ladies' Night for 190 members and guests of the Hamilton District chapter of the Society. The annual affair was held in the Burgundy Room of Fisher's Hotel.

After dinner, a toast to the ladies was given by Jack Yorick. The response was delivered by Mrs. William Shaw.

The gift of a silver plate was presented to Mrs. Jack Yorick, wife of the past chairman.

A fun-filled review program was given by Mr. Yorick, William Orlick, Gordon Hemstock, Mac Dingwall and George Bryant who took the parts of dancing girls in an intricate dance routine.

A fashion show highlighted the evening. Narrated by Mrs. Yorick, a parade of current feminine styles was presented for the entertainment of the onlookers. Participating were Bert Locke, Jack Snyder, Jim Hodgson, Jack Hillier, Jack Yorick, Harry Ward, George Churchill, Ernie Walton and Gordon Hall.

Dancing to the music of Morgan Thomas completed the evening's program.

Weaver Appointed Assistant to V. P.

James R. Weaver, who served as national president of ASTE in 1939-40, has been appointed assistant to T. I. Phillips, vice president in charge of manufacturing for Westinghouse Electric Corp., Pittsburgh.

For the past four years, Mr. Weaver has been on assignment to Baldwin-Lima-Hamilton Corp., where he served as vice president in charge of manufacturing. He joined Westinghouse in 1915.

Three of the 140 couples who attended the Ladies' Night program of the Windsor chapter are shown at the Beach Grove Golf and Country Club where the party was held. From left: Harold J. A. Chambers, immediate past chairman, and Mrs. Chambers; Mrs. D. C. Heath and Mr. Heath, chapter chairman; Mrs. F. A. Ritchie and Mr. Ritchie, second vice chairman and head of the entertainment committee.

Officers of the Pontiac ASTE chapter are shown at the installation meeting. Administering the oath of office is George Bryan. Being sworn in are, from left: David Livingston, treasurer; Edward T. Markham, secretary; H. V. Phipps, second vice chairman; James E. McDonald, first vice chairman; and Ronald J. Hayward, chairman. Special guests at the dinner meeting were the wives of chapter officers and members. Judge H. Russell Holland was the speaker.

Thread Rolling Topic at Montreal ASTE Meeting

Montreal—More than 110 members and guests of the Montreal chapter were on hand for the May 8 meeting held at the Canadian Legion Memorial Building. Guest speaker was Clifford T. Appleton, vice president, Reed Rolled Thread Die Co., Worcester, who discussed "Thread and Form Rolling."

In pointing out the history of this type of work, Mr. Appleton said that although it was known early in the 19th century, it was not used in production until 1880. He demonstrated with slides the various types of roller dies used and the large variety of work which can be produced by this method. He emphasized the savings in both material and time which can be effected by the thread rolling process.

The speaker was introduced by Mr. Howe and thanked by Mr. Welsh. A buffet lunch was provided after the meeting by J. H. Ryder Machinery Co., Ltd.

Stresses Economical Motion Operations

San Mateo, Calif.—Twenty new members of the Golden Gate ASTE chapter were introduced May 21 at a meeting held at the Chukker. Nearly 130 members and guests attended the technical session which included the showing of the film "Tomorrow Meets Today" presented by the Ford Motor Co.

L. K. Edwards of Grove Controls, Inc., Emeryville, Calif., gave a thorough discussion on motions study as it affects tool engineering in a talk on "Some Human Factors in the Design of Tools and Equipment." He cautioned tool engineers to consider economical motion operations during design stages. A film from the University of Purdue, "Make Every Motion Count" supplemented his speech.

Wilson Appointed Operations Chief

William A. Wilson, one of the organizing members of the Los Alamos chapter, is leaving his position at the Los Alamos Scientific Laboratory to become chief of the operations branch of the Pantex Field office for the Atomic Energy Commission. Mr. Wilson served as ASTE second vice chairman in 1951 and was elected first vice chairman in 1952.

Mid-Hudson Members Tour V & O Press Co.

Hudson, N. Y.—The V & O Press Co. was host May 17 to about 65 members of the Mid-Hudson ASTE chapter for a plant tour, buffet supper and technical session.

Those participating in the tour were shown all phases of the production operations necessary in press construction including turning, boring, milling, planing, gear cutting, grinding and various other machining operations. V & O, a division of Emhart Mfg. Co., manufactures automatic dial feeds, open-back or inclinable presses, shell trimmers and threaders and special machinery.

After the buffet supper served at the V & O Lodge, Raymond A. Freeman, chief engineer at the firm, spoke on "Misconceptions of Press Capacity."

He said that the question of tonnage of an inclinable press is difficult to answer at times, as it is governed by several factors, strength of frame, torque of members, flywheel and the motor supplying power to the press.

"Generally speaking," Mr. Freeman said, "presses are rated at certain tonnages which denotes a recognition of structural strength. The specified tonnage is developed near the bottom of the stroke, which recognizes a torque factor. Although the crankshaft can exert power at the bottom of the stroke without torque, greater torque is exerted at a point higher up on the stroke. Normally the rated tonnage is transmitted near the bottom of the stroke."

The flywheel must be large enough to supply the amount of energy required for the operation, Mr. Freeman said. Weight and speed are other factors in arriving at the proper flywheel. He pointed out that when a press slows down, the first thought is a larger flywheel. This is generally true if the press slows down quickly, however, if the press speed decreases slowly, it is an indication that the motor is not large enough.

After the technical lecture, William W. Schug, general sales manager of the V & O Press Co. and past chairman of the Mid-Hudson chapter, showed three dimensional slide pictures of their presses and related subjects.

Named Works Manager

C. Duff Brown has been appointed works manager of Duff-Horton Mfg. Co. He will supervise plant operations for the firm's Jack Div. Formerly superintendent of engineering for McKinney Mfg. Co., Mr. Brown is a graduate of the University of Michigan and a member of the Pittsburgh chapter of ASTE.

The Tool Engineer magazine was the chief topic of discussion at the May meeting of the national editorial committee held at the national headquarters of the Society in Detroit. Conducting the sessions was Wayne Kay, second from left, who is 1952-1953 chairman of the committee. Other members are, from left: Ronald W. Updike, member of Indianapolis chapter; Joseph L. Petz, member of the Mid-Hudson chapter; Louis W. Greenblatt, St. Louis member. Gordon Swardenski of the Peoria ASTE chapter was not present when the photograph was taken. Mr. Kay is a member of Detroit's chapter of the Society.

McKeon Honored for Outstanding Service

Rock Island, Ill.—Dan McKeon was awarded the service pin of the Tri-Cities chapter of ASTE for his outstanding work during the past year at the May 14 meeting held at the Rock Island Arsenal. More than 50 persons witnessed the presentation which was made by Chapter Chairman Lee R. Johnston.

Mr. Johnston and Joseph Zelnio, past chairman, reported on highlights of the Industrial Exposition held in Chicago.

Technical speaker of the evening was Mr. Melnick, chief tool engineer, U. S. Tool Co., Inc., who presented a program on the tooling of multiple slide machines. His lecture was illustrated with slides and films showing intricate tooling set-ups and production of metal stampings on multiple slide machines. Various types of these metal stampings were on display before and after the meeting.

Metallurgist Talks on Engineering Steels

Lancaster, Pa.—The April meeting of the Greater Lancaster chapter was held at the Armstrong Cork Co. Dinner was served in the company cafeteria and the technical session was held in the new Armstrong auditorium.

John W. Juppenlatz, chief metallurgist, Lebanon Steel Foundry, presented an informal discussion on engineering steels and alloy castings. He stressed the importance of using correctly designed patterns for best casting results and using the proper tools to machine steel castings.

A movie on "Steel with One Thousand Qualities" showed how the Lebanon Foundry produces steel castings and how they utilize the centrifugal casting method.

Ladies' Night Attracts 200 Members and Guests

Galt, Ont. — The most successful Ladies' Night program in the history of the Grand River Valley ASTE chapter was held at Leisure Lodge on May 9. Attended by more than 200 persons, the evening's program included dinner and dancing and the quiz show presented by National Director T. J. Donovan, Jr.

Chapter Chairman Dave McCready led a toast to the ladies for their cheerful cooperation, direct and indirect, in ASTE activities. Mrs. McCready responded for the wives present.

National Director T. J. Donovan, Jr., (right) presents past chairman's pin to Harry Sehl.

With Samuel Boyer and Harry Whitehall using wandering microphones, Mr. Donovan entertained the members and guests with his well-known quiz show. Correct answers won wood carvings for the participants which had been donated by the quizmaster.

Percy Barber expressed the appreciation of the Grand River Valley chapter to Mr. Donovan for his work in making the evening such a success.

The past chairman's pin was then presented to Harry Sehl by the guest of honor.

Crosby Addresses Boston ASTE Members

Boston—Joseph P. Crosby, second vice president of the Society, reviewed the 400 exhibits displayed at the Industrial Exposition, at the April 10 meeting of the Boston chapter held at New England Mutual Hall. He also gave a brief talk on the future plans of ASTE.

A technical talk on grinding flat surfaces was presented by D. R. Weedon, assistant manager of the Blanchard Machine Co. He described the qualities of the Blanchard grinder and the correct use of grinding wheels for different types of work. L. S. Kinsman assisted him with the program which included slides.

"The Use of Optical Plates" was the subject of Frank D. Clark of the Van Keuren Co., who used slides to demonstrate the use of Van Keuren helium flame mono-chromatic light for checking flat surfaces.

Technical chairman for the evening was Olaf C. Peterson.

Three speakers were featured at the May 8 program which also included dinner and a travel movie. More than 200 members and guests attended the meeting.

Joseph C. Anthony, projects engineer and die designer, Gillette Safety Razor Co., Boston, gave a talk on the application of carbides for some of the dies used in production at his firm.

Lawrence E. Peterson, plant engineer, United Carr Fastener Co., Cambridge, spoke on his experience with chroming of gages, dies and taps. Charles E. Grede, chief engineer, Barry Corp., and author of *Vibration and Shock Isolation*, explained the advantages and design criteria for shock mounted presses.

Student Members Hear Scully-Jones Engineer

Chicago—Speaker at the April 30 meeting of the Student Section of the Chicago chapter was Harry Conn, chief engineer, Scully-Jones Mfg. Co. He spoke on "Jig and Fixture Design."

Stressing the importance of the location of the piece part to be machined, Mr. Conn explained the different methods of locating parts by making use of holes and flat surfaces and discussed the different clamping devices and their respective applications.

The speaker was introduced by Chairman Gordon VonSchmitteau. The meeting was held at the Allied School of Mechanical Trades.

Other officers of the Student Section are Lester Kropke, vice chairman; Julius Napoli, secretary; and Nick Salamon, treasurer.

Toronto Members Visit Anaconda American Brass

Toronto—A tour of the Anaconda American Barss, Ltd., plant on May 7 attracted more than 200 ASTE members of the Toronto chapter. Following the visitation refreshments were served by the firm in the recreation hall.

Members visited the casting shop where they saw 'cakes' being cast for hot rolling into sheets. In the rod mill the company's new extrusion press was in operation extruding round billets into 1 by 6 inch bars.

The operations witnessed in the tube mill included hot piercing on a Mannesman machine. The chapter was also conducted through the sheet mill where they were able to see hot and cold rolling of sheet and strip copper and brass.

Heckinger Joins Fansteel Sales Staff

Dave Heckinger, Chicago ASTE member, has rejoined the sales engineering staff of Fansteel Metallurgical Corp. Prior to 1948, Mr. Heckinger was Fansteel sales representative in branch offices at Chicago and St. Louis.

Attend Convention

Detroit members, Harvey B. Wallace and Harold E. Robison represented the Wheel Trueing Tool Co. of Detroit at the seventh annual convention of the Industrial Diamond Association of America held recently in Bermuda.

Officers of the Peterboro ASTE chapter and their wives are pictured at the Ladies' Night program held on May 2. From left: Third Vice Chairman and Mrs. Jack Graham; First Vice Chairman and Mrs. Lew Hansler, Secretary and Mrs. Earle Wellman, Chairman and Mrs. Robert Dyer, Second Vice Chairman and Mrs. Gord Page and Don Douglas, chairman of the membership committee.

Chapter Holds First Annual Ladies' Night

St. Thomas, Ont.—The first annual Ladies' Night of the London-St. Thomas chapter was held April 25 at the Terrace Club. Dinner and dancing were enjoyed by 180 members and their guests.

Corsages and plants were presented by the chapter and prizes were awarded to 26 of the guests. Master of ceremonies was Lloyd Wright of radio station CFPP, who introduced the guests seated at the head table.

After dinner, Lou Jenson offered a toast to the ladies. Mrs. Thomas Pherigo replied. The official welcome was extended by Chapter Chairman Al Ward.

Johnny Down and his orchestra provided the music.

Touring visitors from the Toronto chapter of ASTE signed the guest book as they entered the recreation hall at Anaconda American Brass, Ltd. With pen in hand is Cliff Farr, second vice chairman of the chapter, who worked with Labor Supervisor Lee Richardson, far left, on the arrangements for the tour. Also shown are Eddie Beggs, second from left, who acted as guide, and Fred Lockhart, chapter chairman.

150 Members Attend Jones & Lamson Tour

Springfield, Vt.—A large turnout of more than 150 members of the Twin States chapter participated in the final meeting of the year, a plant tour on May 14 of Jones & Lamson Machine Co. in Springfield. A business session and dinner were held at the Trade Winds Cafe.

Actual results of tests running on a production basis highlighted the technical program. Speaker J. C. Hebert of Jones & Lamson talked on high-speed turning with carbides, revealing the records achieved by the company in their research and development programs which were initiated in 1945.

Tests were begun on a bearing race made of 52100 steel forging. It was believed at that time that a cutting speed of 250 to 300 surface feet per minute was maximum. Their tests started at 1100 surface feet per minute. Many different rake angles were tried on the tools and various feeds and speeds between 250 and 1100 surface feet per minute.

The maximum effort was made during all tests to find the right combination of feeds and speeds to produce a white chip which is the coolest. The work and the tool remain cool, thus producing a better finish on the part and giving longer life to the tool.

A number of out-of-state guests were on hand for the meeting, including: Karl R. Crandall, Ernest G. Maloy, R. W. Dow, A. W. D. Black, G. E. Grimley, S. C. Beyerl, Earl R. Cookman, R. E. Nixon, Eugene K. Gardner, Art Gerry, John Englested, Walter H. Simpson and Phil A. Dean. Still others were Jack Harvey, J. A. Anderson, E. G. Heaton, Jr., C. J. Schnieders, G. H. Buck and Jerry Skrel.

Parks Leaves Los Alamos

Joseph Parks, charter chairman of the Los Alamos chapter, is now associated with a private manufacturing concern in Burbank, Calif.

Rochester Chapter Hears Verson Representatives

Rochester—Fred Zapf, sales consultant, Verson Allsteel Press Co., spoke at the April 7 technical session held at Lower Strong Auditorium. The meeting was preceded by dinner at the Faculty Club of the University of Rochester.

In his talk on transfer presses, Mr. Zapf told of the technical problems involved in providing machine tools and die sets from heavy gage blanking, drawing and perforating for the Maytag Washing Machine Co. He elaborated on the three color movies that followed and said that Verson's practice of filming each job after completion had netted the firm a living record of proven and successful techniques.

The first film portrayed the special tooling that Verson had engineered for the Maytag new automatic washing machine. The automatic progression of parts from one die station to another was shown in the film on Verson's transmat presses. The hot drawing of artillery shell cases from billets to the furnaces and to the drawing and trimming presses concluded the film showing for the evening.

A short talk on Verson's achievements in die engineering was presented by Mr. O'Connel, who assisted Mr. Zapf in a brief question-and-answer period.

The speakers were introduced by Second Vice Chairman Gerald Sick. A report on the Chicago Exposition was given by Delegate James O'Horne. Chapter Chairman Charles DeMartin conducted the meeting.

Elected to Board

Walter F. Cahill, Detroit ASTE member, was elected to the board of directors at the annual meeting of Seneca Falls Machine Co., Seneca Falls, N. Y. He has been Detroit sales representative for the firm since 1947.

C. D. Howe, Canada's minister of defense production, is congratulated by Robert B. Douglas on receiving an honorary membership in the American Society of Tool Engineers. Mr. Douglas, past president of ASTE, made the presentation at an informal ceremony in Ottawa, Ont.

Clambake Featured at Elmira Chapter Meeting

Elmira—An indoor clambake closed the 1951-52 ASTE year in Elmira. Members gathered at the Mark Twain Hotel for the 'windup' meeting at which business of the past season and plans for next fall were discussed. A social hour followed the meeting.

Henry LeMaire, immediate past chairman of the chapter, was presented a past chairman's pin and given the appreciation of all the members for his excellent work in guiding chapter activities.

Chairman Banfield gave a brief talk outlining the programs for the coming year. He also asked for volunteers to act as inspectors for the annual soapbox derby in Elmira.

Miller Speaks on "Tooling in Action"

Allentown, Pa.—Lehigh Valley members met May 23 at the Sky Terrace Hotel for dinner and a technical session. About 50 members and guests heard Werner O. Miller, chief tool engineer, Textile Machine Works, Reading, speak on "Tooling in Action."

Mr. Miller told of the tooling required for manufacturing 150,000 extremely accurate, interchangeable parts necessary in building full-fashioned knitting machines. Samples and drawings showed highly developed techniques in the use of carbides for drilling, boring, reaming and milling as well as in the construction of compound piercing and blanking dies for very thin steel spring stock.

Party plans were in the air for the program committee of the Rockford ASTE chapter when they sat down to make the arrangements for the chapter's annual "stag." Pictured at the committee meeting are, from left: William Moreland, first vice chairman; Bruce Lundgren, chapter chairman; Walter Frazier, head of the program committee; Marshall Samuelson, member of the program committee; and Russell Carlson, member of the program committee.

Reviews Automatic Transfer Making

Rockford, Ill.—"Automatic Transfer Making" was the topic covered by Melvin D. Verson, assistant sales manager, Verson Allsteel Press Co., Chicago, at the May 8 meeting of the Rockford chapter of ASTE. More than 80 persons attended the session held at the Lafayette Hotel.

Mr. Verson showed two sound movies, one on hot extrusion of 105 mm projectiles, the other covered automatic transfer press working at the Maytag Washing Machine Co. He was accompanied by Emmett O'Connell and Mr. Neff.

Coffee speaker at the dinner meeting was John Stafford, executive secretary of the Rockford Chamber of Commerce.

The Society's time and place committee, named by President Bellamy, met at national headquarters in May to discuss the locations of future meetings of the Society. Their recommendations will be reviewed by the ASTE board of directors. Pictured here, from left to right, are: First Vice President Roger F. Waindle, Program Committee Chairman J. O. Horne, Executive Secretary Harry E. Conrad, Past President Ray H. Morris, Assistant Executive Secretary Allan Ray Putnam, Past President Douglas D. Burnside, and Past President Robert B. Douglas.

Simon Collier New President of ASQC

New officers of the American Society for Quality Control were installed at the annual banquet at the sixth annual convention held May 22-24 in Syracuse, N. Y.

Succeeding Wade Weaver, Republic Steel Corp., as president is Simon Collier, director of quality control, Johns-Manville Corp., N. Y. Vice presidents of the society are: Arthur Bender, Jr., quality engineer, Delco-Remy Div., General Motors Corp.; Raymond S. Saddoris, directory of quality, A. O. Smith Corp.; and Dr. Julian H. Toulouse, chief engineer, Quality and Specification Dept., Owens Illinois Glass Co.

Installed as executive secretary was Edward B. Haden, quality control director, Esterbrook Pen Co. Paul A. Rober, International Business Machines Corp., will again serve as treasurer.

More than 2,000 persons attended the three-day convention which was held at the Onondaga County War Memorial Auditorium. Activities included technical sessions, committee meetings, board of directors meeting, exhibits and a ladies' program.

Other News in This Issue

Chapter	Page	Chapter	Page
Boston	78	Rockford	81
Cedar Rapids	83	South Bend	77
Chicago	78, 85	Toronto	80
Cincinnati	85	Tri-Cities	78, 83
Dayton	74	Twin States	80
Denver	83	Wichita	77
Elmira	81	Windsor	77
Golden Gate	78	Worcester	83
Grand River Valley	78		
Greater Lancaster	78	Chapter Chairmen	71
Greater New York	74	Connecticut Night	76
Hamilton District	77	Editorial Meeting	78
Kansas City	76	Honorary Membership Presented C. D. Howe	81
Lehigh Valley	81	Lima Chartering	75, 76
London-St. Thomas	80	Positions Available	78
Mid-Hudson	78	Public Relations Meeting	76
Mohawk Valley	85	Quality Control Officers	82
Montreal	78	Scholarships	82
Northern New Jersey	83	South West Area Meeting	72
Peterboro	80	Time and Place Committee	82
Pontiac	78	Visit to Utah State Agricultural College	84
Potomac	77		
Rochester	81		

Diamond Announces Scholarship Awards

Winners of four 1952 scholarships provided annually by the Society have been announced by A. R. Diamond, chairman of the National Education Committee. The awards will go to: Raymond F. Perner, University of Texas senior; Hearst McClellan, University of Cincinnati junior; David Lee Poli, senior at Ohio State University; and Merton L. Bartsch, senior at the University of Minnesota.

Announcement of the recipient of the fifth scholarship, to be awarded to a Canadian student, will be made later this summer.

Judged on the basis of academic standing, specific professional interests, personal qualifications and recommendations of faculty advisor, each winner will receive up to $300 to further his university education.

Poli

Bartsch

McClellan

Perner

Mr. Perner has held several summer-time engineering positions and holds membership in Pi Tau Sigma, honorary mechanical engineering fraternity. Chairman of the University of Texas ASME chapter, his major professional interests lie in the field of manufacturing, production, and industrial relations.

Also active in a student chapter of ASME, Mr. McClellan has had many years of experience as a machinist and draftsman and has done part-time work as a designer for a consulting firm and applied research laboratory. His particular interests at the University of Cincinnati are machine shop tools, machine design and production tools.

The industrial experience of Mr. Poli includes summer work as a draftsman and part-time, second operation work on automatic screw machine products. His major interests, from a professional

(Continued on next page)

Worcester Members Tour Morgan Construction Co.

Worcester—A conducted tour of the Crescent Street Plant of Morgan Construction Co. was held in the late afternoon of May 6 by members of the Worcester ASTE chapter. About 50 members saw the large scale of machine operations involved in steel-mill manufacture. Groups of about 10 visitors were supplied with a guide to answer questions and explain methods.

A dinner meeting held at Putnam & Thurston's followed the tour and at 8 p.m. 75 members heard John H. Hitchcock, director of research, Morgan Construction Co., speak on "Continuous Rod and Bar Mills."

He described the role which mills of this type play in the production of steel, highlighting some of the interesting problems which arise in the design and operation of such mills.

The talk was illustrated by sound films in technicolor which showed two modern mills in operation, one of which was the much publicized new mill of the Colorado Fuel and Iron Corp.

Chairman E. Roland Ljungquist presided at the business meeting and Program Chairman John E. Rotchford handled the arrangements for the evening's activities.

Scholarships

(Continued from page 82)

point of view, are tool design, product design and mass-production manufacturing processes. He has one more year to complete in industrial engineering at Ohio State University.

A laboratory assistant in the University of Minnesota's forge shop, Mr. Bartsch intends to specialize in production engineering with a degree in mechanical engineering. He is active in the student group of ASME and plans on entering the graduate school for his fifth year of study next fall.

Above: A view of the installation banquet of the Northern New Jersey chapter of ASTE. National Director T. J. Donovan, Jr., (at microphone) administered the oath of office to the men who are guiding Northern New Jersey activities. From left: H. Wilson Ryno, secretary; John Wanelik, second vice chairman; Mr. Donovan; W. E. Wheaton, first vice chairman, James Allen, past chairman and Clyde C. Shannon, chairman.

Upper photograph: Speakers at the Denver chapter are pictured with ASTE officers. From left: Marion K. Beebe; C. J. Helton, first vice chairman; John Hussey, American Tool Works, Cincinnati; F. J. Geoffroy, chairman of the chapter; Norval Allen, secretary; George Buckel, treasurer; and Iver Esbenson of the Esbenson Machine Tool Co. Lower photograph: Shown at the Bendix Aviation Corp. tour taken by over 300 members of the Cedar Rapids Tri-Cities chapters of ASTE are, left to right: George Lethwaite, general manager; Dan McKeon, tool room foreman and membership chairman of the Tri-Cities chapter; Ed Klouda, Cedar Rapids chairman; Lee Johnston, Tri-Cities chairman; M. W. Hill, master mechanic and H. J. Morley, factory manager.

A Visit to Utah State Agricultural College

By Andrew E. Rylander

Still getting around and covering ground, I went to Utah State Agricultural College the week end of May 2, the occasion being the spring meeting of the Utah Engineering Council, in which Salt Lake chapter took an active part. This council, which met this year at Logan, is an organization of all of the professional engineering societies in Utah and promotes engineering education and activities in the state.

The invitation to attend had been extended by Prof. Frederick Preator, head of the School of Tool Engineering at Utah State, and standard bearer in getting this course initiated at the college. In the achievement of this goal, he had been strongly supported by the Council.

I started for Utah under some handicap. Because of sinus trouble, which bothers me at high altitudes, I dislike flying, and snow slides in the Sierras and floods in the valleys were raising havoc with train schedules. To top it off, I couldn't get a Pullman reservation, so took a coach; but, luck being with me, managed to phenagle a roomette enroute and got into Ogden on time to boot. There—6:25 a.m.—I was met by Prof. Preator, who drove me the 45 miles to Logan.

Breakfast at the Bluebird, Logan, which if not endorsed by Duncan Hines, has my unqualified okay when it comes to good food. Then, during the forenoon, a drive up Logan Canyon as far as Bear Lake hard by the Idaho and Wyoming borders. Breath-taking scenery, and so warm that, despite shoulder-high snow in spots, one could move around in shirt sleeves. A spring of purest water gushing in a torrent out of a mountain cave, and fossils dating back millions of years to the time when the entire area was sea bottom.

The afternoon was spent in reviewing a military drill—all students must enroll for UMT—that would have done credit to Army regulars, and also reviewing the various exhibits, including one by the School of Tool Engineering. Photographs of this ASTE booth have been mailed to Miss Morgan in hope that she can find space for them in the ASTE News Section.

The department headed by Prof. Preator boasts an excellent mechanical laboratory and machine shop which, in connection with engineering curriculae, gives the student a comprehensive practical training in addition to a thorough grounding in theory. I had occasion to chat with a graduate—Joe L. Oviatt—now employed and an enthusiastic booster for the course. Of particular interest, as far as the practical course is concerned, is that jigs, fixtures and other tools made by the students are in actual use in Utah industries.

Toward evening, and just before the banquet, I met Les Seager and Harry Todd, of Salt Lake chapter. To show that it's a small world, we had been playing tag with one another when I went to Rockford, just after the Show in Chicago, the meeting there having been too brief for anything more than a "hello" and a handshake.

At the banquet, at which Dan M. Schwartz, president of the UEC presided, I found myself at the head table along with Les Seager and the college brass which included President Louis L. Madsen, Dean Jerald E. Christensen, and the guest speaker, Dean I. M. K. Boelter of the College of Engineering, University of California, Los Angeles. Entertainment consisted of vocal selections by Prof. J. P. Dalby, Director, U.S.A.C. Band, and a piano solo by Miss Carol Watkins, Engineers Queen for 1952.

In presentation of engineering awards by the various affiliates of the UEC, American Society of Tool Engineers Scholarships were awarded, on behalf of Salt Lake City chapter, to David K. Darley and Jay Beaser, and a *Tool Engineers Handbook* and Pin to Shelden Eppich, of the School of Engineering. On the whole, a very impressive ceremony.

As a Society, I think that we can be quite proud of a member of Prof. Preator's calibre, equally p[illegible]d of chapters which, remote from the larger industrial centers, nevertheless foster tool engineering education in their areas and so inspire a better de[illegible]n for living. As for my impressions o[illegible] Utah, well, it's rugged country ope[illegible]d by rugged pioneers who, with their seed, have turned it into a lush oasis among the Rockies.

Shortly after return to Cali[illegible]nia—where, incidentally, I ran into a hot spell that put the scorchers of the Middle West in the shade—all very unusual, y'know—I had a letter from Vincent Diehl, ch'man elect *pro tem* of San Jose chapter-in-forming held at San Jose State College, asking me down there for their May meeting. There, I met Director Ben Hazewinkel and Wayne Ewing, of Los Angeles, both of whom took an active part in the program. Me, I just did the heavy looking on.

At this pre-charter meeting, all officers *pro tem* were reelected at a formal election conducted by Director Hazewinkel, the exception being Secretary Bill Ware, who asked to be removed for valid reasons. The slate as it now stands consists of Vincent Diehl, Ch'man; W. C. Lanyon and E. F. Roskowski, 1st and 2nd V.C., in that order; and R. D. Harper, Treasurer; and George Randolph, who replaced Ware as Secretary.

Not that the election was entirely one-sided since, with the exception of Vincent Diehl, the rest of the slate had close competition. And that's good!—evidence of plenty of officer talent in the San Jose area. In fairness to the electees, however, it must be said that they had worked hard and diligently in organizing the chapter. Their election was therefore deserved.

(Continued on next page)

Prof. Karl Somers (center) discusses one of the exhibits at Utah State Agricultural College with Prof. Frederick Preator (left), head of the school's Tool Engineering Department, and ASTE's Andy Rylander.

Utah Visit

(Continued)

Speaker of the evening was Louis A. Talamini—Talley to his friends—of Schlage Lock Company, San Francisco. With him, I had something in common outside of our ASTE membership, both of us having worked at Western Electric Co., New York, 'way back when. Supplementing a display of modern locks was a huge but ingenious wooden lock, used in Jerusalem some 2000 years ago. Quite a gadget!

Unfortunately, I couldn't stay for the end of the meeting, and hereby tender explanation rather than apologies for walking out on a most interesting talk. It so happened, however, that I'd taken the Missus along—it's really a beautiful drive!—and, being under the impression that the college closed at 10 p.m., had arranged to meet her shortly after that hour. Besides, it turned cool, and what with the drive home over winding and to me somewhat unfamiliar roads, I didn't want to keep her waiting. Consideration, like charity, begins at home.

Missed out on Golden Gate chapter's May meeting, held at the Chukker Restaurant in San Mateo, due to previous commitments. Sorry about that, as I would have liked to have heard L. K. Edwarde's talk on "Some Human Factors in the Design of Tools and Equipment," let alone getting together with the members of what is now my "home" chapter. From later reports, however, I have it that the meeting was highly successful. And that, with hopes that we'll meet again during my ramblings over the coming month, will be all for now.

Cincinnati Members Hold 14th Anniversary Meeting

Cincinnati—The fourteenth annual dinner meeting of the Cincinnati chapter was attended by 225 members and guests who met in the Marie Antoinette Ballroom of the Sheraton Arms Hotel to hear National ASTE President L. B. Bellamy, Judge James Garfield Stewart of the Supreme Court of Ohio, and Dr. Frank C. Hockema, vice president and executive dean of Purdue University.

Mr. Bellamy gave a brief talk to the chapter in which he reviewed the progress of the Society during the past years. Judge Stewart presented a speech titled "Fellow Tool Engineers," emphasizing the promotion of a more liberal attitude between the various races, creeds and nationalities.

"Tooling for Improved Services" was the topic covered by Dr. Hockema. His philosophy recognizes the abilities of technical men to contribute to a better way of life through technical skills, enthusiasm and intellectual integrity.

Ben Fluery (left) congratulates John Neal Post on becoming the 1,000th member of Chicago's ASTE chapter. Mr. Post was welcomed at the group's meeting held May 5.

Albert Vogel Appointed Special Representative

Albert Vogel, member of the Northern New Jersey ASTE chapter, has been named special service representative for the Wood Newspaper Machinery Corp. Mr. Vogel was employed by Walter Scott & Co., Plainfield, N. J., as a designer, chief draftsman, works manager and chief engineer for a period of over 25 years.

For the past six years, he has been associated with the American Type Founders, Inc., and the Daystrom Instrument Div.

Named to New Post

Thomas M. Thornton has been appointed district sales engineer for the Michigan area by Norton Co. A member of the Detroit ASTE chapter, he has been with the firm since 1944 as a field engineer. Prior to that time he was with Ford Motor Co. for 22 years.

1,000 Members on Chicago ASTE Roster

Chicago—The 1,000th member of the Chicago chapter, John Neal Post, was introduced at the May 13 meeting and presented a senior grade ASTE pin by Ben Fluery. Witnessing the presentation which marked a milestone in the history of the chapter were more than 150 members and guests..

Featured speaker at the session was Dr. Frank C. Hockema, vice president and executive dean of Purdue University, who spoke on "The Future of Tool Engineering."

After telling how great a role tool engineering plays in our daily lives, Dr. Hockema said that all technical problems involve social problems and the executive dealing with these problems must use supervision, not "snoopervision." Dr. Hockema said "Confidence should be developed in all levels of the organization. Religion produces confidence of the soul which in turn produces harmony among people which is vital if we are to have faith in ourselves, our firms and our countries."

Mohawk Valley Chapter Hears Bendix Executive

Utica, N. Y.—Hugo W. Petterson, assistant to the vice president in charge of industrial relations, Bendix Aviation Corp., South Bend, was the technical speaker at the May 27 meeting of the Mohawk Valley chapter. The session was held at the Moose Home.

Mr. Petterson spoke on the topic "Ceiling and Visibility Unlimited." He gave a discussion on the history of the Bendix Corp., outlining its present and future aims in industrial relations. He also spoke on the way in which individual citizens can realize unlimited opportunities in civic relations.

Pictured at the fourteenth annual meeting of the Cincinnati chapter (seated, from left) are: Richard Niebusch, first vice chairman; Judge James G. Stewart and Joseph Aprile, chairman. Standing: Walter De Roche, secretary; L. B. Bellamy, national president of ASTE; Dr. F. C. Hockema, speaker; Edgar Routzonko, past chairman and Frank Heap, treasurer.

News in Metalworking . . .

GOVERNMENT MOVES TOWARD INDUSTRY STANDARDS ACCEPTANCE

Nationally recognized industry and technical society standards now will be used "to the maximum extent practicable" in developing Federal and Military Specifications and Standards. This development was brought about through Public Law 152 which largely was a result of recommendations made by the Hoover Commission and has given the General Services Administration overall responsibility in the whole area of standardization without regard to type upon material, supplies or equipment.

In commenting upon the subject, Willis S. MacLeod, director of the Standards Division, Federal Supply Service of General Services Administration, who made the statement in an address to the Standards Council of ASA, called the directive the most significant step taken in government standards work in the past 30 years.

Prior to this the complaint of industrialists has been that the government and military services have generally ignored usable industry standards, and by writing their own specifications have required considerable in extra time and money expenditures. In reply to this theory, Mr. MacLeod said that because of the regulatory aspects of government buying his group had been powerless to stop it. Under the new plan, he said, the administrator of General Services has the authority to decide when specifications are justified and when not.

The directive also made the administration responsible for developing, maintaining and making mandatory on all agencies of the government a series of uniform standard purchase specifications known as Federal Specifications. "Normally," Mr. MacLeod commented in referring to this fact, "this will be done by adopting by reference or by transcription from such industry and technical society standards or portions thereof and issuing the result as coordinated or Interim Federal or Military Specifications or Standards, without deviation."

Already, he said, General Services has adopted 45 American Standards and analysis indicates that possibly 210 others will be adopted in the Federal Specifications.

There has been considerable commentary on the directive change. Vice-Admiral George F. Hussey, Jr., managing Director of ASA said that the change in government policy "will save literally millions of dollars and hours of work. It will save the work of government engineers who labored to draw up government specifications when perfectly good industry standards were available. It will save the work of those industry engineers who labored to interpret those standards when they differed and departed from the best industry practice."

Thomas D. Jolly, in charge of engineering and purchases for Alcoa called the new instructions possibly the most important forward step the government has ever taken in standards work. The statement was contained in an address before the Company Member Conference of ASA. It means, Mr. Jolly said, that the government will no longer write its own specifications for such articles of common use as chairs, pencils and photographic equipment, but now will accept the standards of qualified manufacturers.

"Common sense and all past experience," Mr. Jolly pointed out, "demand that private industry build up a comprehensive integrated set of national standards for use by military procurement agencies."

Along the same line, Rear Admiral Joseph W. Fowler, USN (Ret.), who addressed the same conference, men-

tioned as unfortunate the Munitions Board policy that sharply restricts the Board's dealings with industry and technical societies, but he said that everything possible is being done to bring about closer liaison. Admiral Fowler is director of Supply Management Agencies in the Munitions Board. "Whenever possible," he pointed out, "we are adopting industry standards believing that the interest of the government will be best served by adherence to the practices and procedures of normal industry operation. We have been fighting a battle against overspecification, rigid specifications which limit the production base, and standards which sponsor bottlenecks."

The Carborundum Metals Company, Inc., recently formed subsidiary of The Carborundum Company, is scheduled to produce zirconium and hafnium metal under a contract signed with the Atomic Energy Commission. Zirconium, with its desirable properties of corrosion resistance, ductility, strength and low rate of absorption of neutrons, is useful in the construction of nuclear reactors.

Prior to the time the Government began pilot plant operations about two years ago, it had not been produced on a large scale. The Carborundum contract, according to A. Tammaro, manager of the A.E.C.'s Chicago operations office, represents a significant step in the commission's program to encourage private enterprise, using private capital to take over portions of the A.E.C. work which can be handled on a conventional business basis. The contract provides for the sale at a unit price of less than $15 per pound of approximately 150,000 pounds of zirconium and hafnium sponge metal per year for a period of five years.

Carborundum Metals will design, build and operate its own production facility. Up to now the Commission's requirements for the two metals are being met by pilot plant production at government-owned facilities at Oak Ridge, Tennessee, where the raw material is purified and Albany, Oregon, where purified zirconium oxide is converted into metal.

Niles C. Bartholomew, formerly assistant director of manufacturing of The Carborundum Company, was appointed vice-president of Carborundum Metal, and will direct the organization and operation of that subsidiary.

STANDARD TOOL OPENS BRANCH

A branch of Standard Tool Co. is being erected at Dallas, Texas, to aid distributors in the southwest area.

According to the announcement, made by Paul E. Lees, president of Standard, occupancy will be about August 1.

PROGRESSIVE WELDER ACQUIRES BATES PLANT

Progressive Welder Canada Ltd. has purchased the P. D. Bates Co., Ltd., plant at Ridgetown, Ontario. The newly acquired plant will produce resistance welding equipment of all types and fixtures for military and civilian tooling programs. At the same time it will house the metal stamping division.

Main offices have been transferred from the company's other Canadian plant, in Chatham, to the new location.

APEX BEGINS PLANT FOR CLAY-TO-METAL REDUCTION

A commercial pilot plant to produce alloys containing aluminum and silicon from clays is now under construction in the Pacific northwest for the Apex Smelting Co. According to a statement by the company officials production will be expanded as soon as optimum design is proven in the pilot operation.

Five years ago Apex began to investigate the direct reduction of clays containing aluminum and silicon. Through the cooperation of the Tennessee Valley Authority and the Bureau of Mines, the company was able to develop further details of this process. Subsequently, exhaustive tests of the alloys produced in the experiments showed successful results, and the present step in the development plan was taken.

CARBOLOY OPENS EDMORE FACILITY

Open house festivities marked the official completion of the new 45,000 sq ft plant near Edmore, Michigan, standard carbide tool fabricating plant of Carboloy Department of General Electric Company at Edmore, Michigan. The plant already is mass producing standard carbide tools on a production line basis.

Ceremonies included plant tours, product displays, entertainment, TV interviews and a speaking program in which officials of Carboloy, G-E and Consumers Power took part.

The Alnico permanent magnet manufacturing plant, scheduled for completion in 1953, will be located adjacent to the Edmore plant.

GOVERNMENT ASSURES COPPER HOLDERS

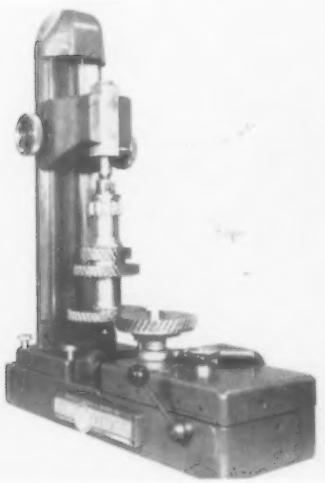
Domestic holders of refined copper can be assured that such copper can be converted for their use according to a recently released advisement of the Copper Division of the NPA. The necessary permission for such conversion into CMP forms and shapes may be obtained by applying to the Division, furnishing information specified in paragraph "C," section #6, NPA Order M-16.

Tools of Today . . . .

Rolling Fixture

A gear rolling fixture with a column type workhead has just been announced by National Broach & Machine Co. of Detroit. Its use indicates errors in both size and eccentricity of the work gear. In addition it reveals any excessive tooth roughness that may exist.

The adjustable work head is set at precise center distance from the master gear spindle carried on a floating spring-loaded slide. This is usually done with precision gage discs.



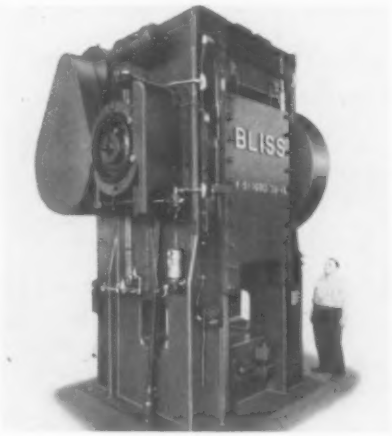
When the work gear is rolled in mesh with the master gear, the errors indicated above are read directly on a dial indicator actuated by any movement of the master gear slide.

The column type work head assures maximum rigidity. The upper center which is counterbalanced facilitates quick setup. It is also spring-loaded for easy loading and unloading. The knob on the right of the column is used to raise or lower the center slide. That on the left is used to lock it in place.

T-7-891

Forging Presses

Development of an improved line of high-speed forging presses is announced by the E. W. Bliss Co., Canton, Ohio. Available in capacities from 300 to 4,000 tons, the line features a heavy duty air friction clutch and an air-release spring-set brake, both mounted on a full eccentric main shaft. The welded steel frame is designed with the main stress members located immediately adjacent to either side of the die seat and extending from the bottom of the bed to the top of the crown. These members have unusually heavy sections to keep the elongation of frame to a minimum when load is applied to press. A heavy plate, integral with the two front gibs, is bolted securely to the main stress-carrying members. This plate, in addition to massive frame tying members in the rear of the press, opposes the inward deflection of frame toward the slide ways. The front of the slide has long and continuous gib ways extending up into the crown to keep the dies in alignment when off-center loads are applied.



Regular equipment furnished with the press includes a cam knockout in the slide and a cam liftout in the bed. The die seat is a self-contained unit, equipped with an easily operated wedge adjusting mechanism. **T-7-892**

Moto-Screwdriver

Light in weight, small in size, and designed to be used without fatigue at right angles to the work, these Dremel tools were shop-tested for more than one year before being marketed. The smaller model SD-1 drives free-running

screws or nuts from #0 to #4 inclusive; the larger model SD-2 is for sizes #4 to #8 inclusive. Model SD-1 weighs but 12 oz., is 4¾ in. long, with a driver-bit speed of 1400-1600 rpm.

Dremel Moto screwdrivers can also be used for unscrewing by merely inserting a bit into the top chuck and turning the machine over in the hand. Both models are equipped with a handy slip clutch to assure even screw tension and eliminate stripping of threads.

T-7-901

Brazing Alloy

Handy & Harman, New York, has announced the development of a new metal joining composition to be known as "EB" Silver Brazing Alloy. It is primarily intended for use in brazing chromium carbide, cast carbides and other "hard-to-wet" carbides. Effective results have also been obtained on high tungsten-copper alloy, cermets and other refractory alloys difficult to braze.

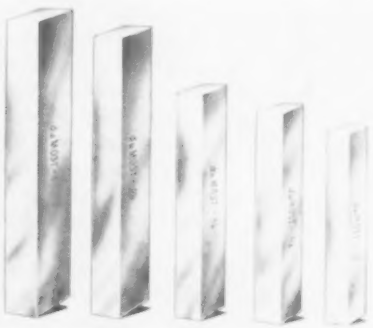
The new alloy is composed of 57 percent silver, the balance of the composition includes copper, manganese and tin. It has a melting point of 1120 deg F and a flow point of 1345 deg F.

There are no volatile elements in this alloy, an important factor in vacuum applications, and it is non-susceptible to dezincification type of corrosion. It has been successfully used on type 316 stainless steel subject to dilute mineral acid corrosion. This does not imply a general recommendation for corrosive service but does indicate a quality which may prove useful when evaluated by tests under actual service but does indicate a quality which may prove useful when evaluated by tests under actual service conditions.

T-7-902

Tool Bits

The du Mont Corp., Greenfield, Mass., is introducing a line of tool bits made of a special super HS steel with precisely blended and balanced carbon and vanadium which produces extra fine grain structure. The bits are heat-treated to achieve 66 to 68 "C" scale



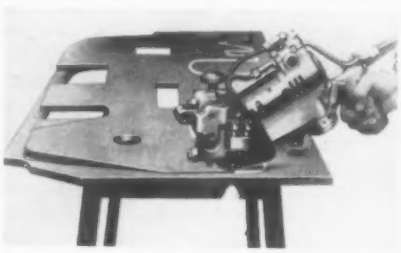
Rockwell and are ground to close tolerances without decarburization. Tests have proved that these du Most bits have extraordinary toughness and resistance to abrasive action. Their performance compares favorably with cobalt steel bits in all cases where extreme heat resistance is not the major factor.

du Most tool bits are offered in squares with both ends beveled 20 deg in nine sizes, from ¼ in. square by 2½ in. long to 1 in. square by 7¼ in. long.

T-7-911

Flame Cutter

The Cadet, a portable, hand-operated flame cutting machine which weighs only 19 lb has been announced by American Pullmax Co., Inc., 2455 N. Sheffield Ave., Chicago 14, Ill. The company states that the Cadet will do plate cutting from 5/64 to 2¼ in.



This oxy-acetylene flame cutter will do straight cutting and I-beam cutting. It will do circle cutting to a radius of 1 in. and will also do bevel cutting. The torch of the Cadet can be set at any angle for bevel cutting. Graduations in five-degree increments are inscribed in the torch holder body.

The Cadet has a self-contained electrically-driven motor. A table is attached to the machine giving proper selection of cutting speed, oxygen pressure and torch tips—even the correct distance between tips and work surface.

T-7-912

Rotoblast Barrel

Pangborn Corp., Hagerstown, Md., announces its new airless rotoblast barrel designed to increase production and lower costs while maintaining high cleaning efficiency. Two sizes are available in the new line, 6- and 12-cubic foot capacity. Others will be added later.

The new barrel, designated as Type GX, has several features aimed at improving cleaning operations while reducing abrasive loss. A newly-designed work conveyor is driven by a hardened steel chain and uses special cast ductile iron slats which will not pinch the work. The conveyor slats turn on the pitch line of the sprockets and the distance between slats is always the same at any point in travel. This prevents passage of wire or chill nails into the track of the chain where operation could be affected.

Drive is by means of V-belts to a spur gear reducer mounted directly on the work conveyor shaft. When the barrel is operating, the conveyor travels upward to tumble the castings. After the cleaning operation, direction of the conveyor is reversed and the load is discharged into the work loader. Conveyor take-up is located on the bottom shaft where weight of the conveyor makes it easier to adjust. An automatic throw-out torque arm disengages barrel drive in case of jams. It works in both loading and unloading directions.

An abrasive-tight door and housing have been developed to retain abrasive within the machine and permit economical use of new types of abrasives. The door is woven wire mesh backed with vulcanized rubber and slides on rollers in a mechanized labyrinth. It rolls up compactly out of the way as it is opened, permitting easy access to the cleaning chamber. A crank actuates the door and it can be held at any position by a positive brake. It is expected that the rubber facing on the door will mean a considerable decrease in wear and maintenance. **T-7-921**

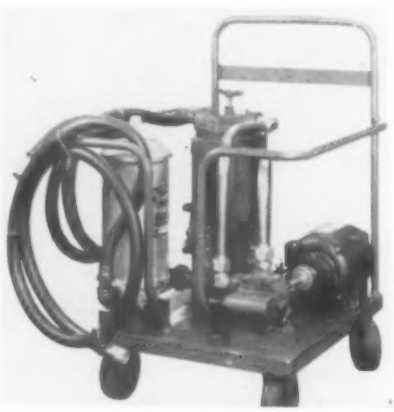
Mitering Tool

Metalmitre is a hand tool that permits professional on-the-job mitering of metals with all the ease and precision of heavy, stationary machine operation. Its leverage produces clean and accurate cuts with a mere squeeze of the polished stainless steel handle. Various

type dies are available—all hardened and precision ground tool steel, capable of burr-free mitering, notching, slotting of non-hardened steel up to $\frac{1}{32}$ in. and metals like copper and aluminum up to $\frac{1}{16}$ in. The snap-in feature makes dies instantly interchangeable. Made by Lander & Abbott, La Crescenta, Calif. **T-7-931**

Filtration Unit

A two-stage portable transfer unit for cleaning hydraulic oils in machine tools, has been designed and built by J. N. Fauver Company, Inc., 49 West Hancock, Detroit 1. It consists of a Yale & Towne Pump, and a Cuno auto-klean metal-edged filter used in the first stage.



The second stage filter is a Cuno micro-klean filter which filters out everything to twenty-five microns, (one thousandth of an inch) in size. All the tubing and Parker fittings are to JIC standards and $1\frac{1}{2}$-in. hose assemblies are provided for quick assembly to the tanks; circulation rate, ten gallons per minute. **T-7-932**

Portable Grinder

Announced jointly by the Carborundum Co., Niagara Falls, N. Y., and Buckeye Tool Corp., Dayton, Ohio, a new belt grinding attachment offers the possibility of a completely new range of applications for the versatile portable tool.

The attachment, made from lightweight aluminum castings, consists of an idler pulley, the supporting mechanism, and a contact wheel; the latter being mounted on the tool spindle. The contact wheel is a small-sized version of the serrated No. 61 wheel by Carborundum currently proving so successful in backstand belt grinding and polishing operations. The unit is attached by a split bracket to the casing of the tool where grinding wheel guards are normally mounted. This bracket makes the attachment adaptable to almost any portable tool of the proper speed and type.

In extensive field tests of the two models now available, the maintenance of tool spindle speeds proved to be an important factor in achieving highest metal removal efficiency and maximum abrasive belt life. Excellent results in these tests were obtained using a Buckeye C series horizontal grinder with a

2 x 1-in. contact wheel and a Buckeye D series grinder with the 4 x 2-in. wheel. These tools deliver constant spindle speeds of 15,000 rpm and 9000 rpm respectively. Speeds from 5,000 to 10,000 surface feet per minute are recommended for efficient belt usage wherever possible. Initial belt sizes for these two models are 12 x 1 in. and 20 x 2 in. A wide variety of grit sizes and backings may be used. **T-7-941**

Tapping Chuck

Errington Mechanical Laboratory, Inc., Staten Island 4, N. Y., announces the introduction of the 000 Cone drive tapping chuck. This new chuck is small, compact and light in weight. It runs best at high speeds and has maximum capacities. It features inter-

changeability of shanks. The 000 Cone drive tapping chuck has an oil-resistant celeron cone and needle bearings top and bottom of main spindle. It is very sensitive with minimum play between drive and reverse. This tapping chuck is built with strength and ruggedness needed for high production tapping. It is available with collet chuck or Jacob rubber-flex tap chuck. **T-7-942**

Drilling Machine

For production drilling operations, The Cosa Corp. of 405 Lexington Ave., New York 17, is introducing the Bekoma turret drilling machine with either four or six spindles.

Driven by one motor, the spindles are mounted radially on a circular carrier, which revolves around the center column. Each spindle has a hand feed, adjustable depth stop and spindle return spring with variable tension. A central V-groove pulley drives each spindle independently. The torque to the spindles is transmitted through hardened spline shafts. By using adjacent spindles as intermediate countershafts, 24 spindle speeds, ranging from 28 to 1500 or 56 to 3000 rpm, can be obtained.

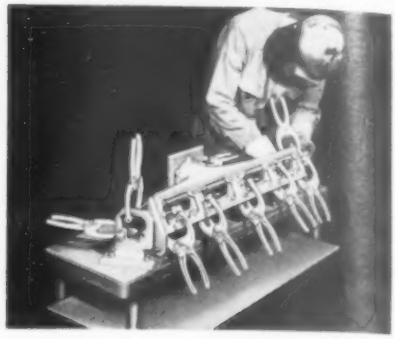
Spindles have No. 2 Morse Taper and accept drills up to $2\frac{3}{32}$ in. in diameter; maximum travel, 5 in.; vertical adjustment, 6 in.; maximum distance between spindles and table, 16 in.; distance between spindles and column, $6\frac{3}{4}$ in.

This turret design conserves floor space and permits from one to four operators to work at the same time. The machine can be equipped with multi-spindle heads or tapping attachments.

Workpieces need not be moved from one spindle to the next as the spindles can be indexed and brought, in turn, into the exact working position. The indexing motion is controlled by a lever mounted at the side of each spindle. One movement releases the index block, accomplishes the indexing motion and re-locking action. The rotary movement of the turret is braked by a unique mechanism, which also prevents overload of the indexing pin. **T-7-951**

Toggle Clamps

A welding fixture utilizing De-Sta-Co portable toggle clamps has been designed by the Steel Cooperage Div. of the Serrick Corp. The fixture holds four rectangular and three round engine manifold flanges to an alignment plate during an inert arc welding operation prior to final stainless steel welding. A "V" type prong replaces one



clamping jaw on three of the twelve model #468 portable toggle clamps used, to provide additional gripping area on the manifold stamping. Precise alignment is important because the flange openings must fit on machined engine block studs.

After the tack weld application the manifolds are transferred to the final operation, where the flanges are arc-welded with stainless steel rod. The manifolds are part of Ford engines which are replacing worn-out equipment in the reconditioning of Sherman tanks. Set-up time has been cut to a minimum with the use of De-Sta-Co's portable toggle clamps. Approximately 54 manifolds are completed per fixture during an 8-hour shift. **T-7-961**

Scale Unit

A new development in automatic scale indication was announced by the Howe Scale Co., Rutland Vt., with the introduction of the Howe 77. A weighing accessory, featuring a projection type of weight indication, the unit can be attached to any make of beam scale, or to any scale convertible to beam operation, making a beam scale an automatic of the latest type.

The Howe 77 Weightograph features a non-protruding periscope with a convenient eye-level screen which flashes the exact weight in large, illuminated, crystal-clear figures for easy, speedy and accurate reading. It is designed with the latest methods of optical projection which increases image brightness and contrast five times. The image is read off the mirror instead of a ground glass screen, which contributes greatly to the readability of the image under all sorts of light including daylight. The reading line length is 180 inches (15 feet). **T-7-962**

Grinding Wheel

Development of a cup grinding wheel which retains its sharp cutting edge throughout its service life was announced today by the mechanical goods division, United States Rubber Co.

The wheel has a hard shell of tough resin-bonded abrasive built around a core of rapid-cutting resin-abrasive construction. This shell, which is three-sixteenths of an inch thick, resists "mushrooming" or rounding of the wheel's cutting edge. Wear occurs evenly across the entire face of the wheel.

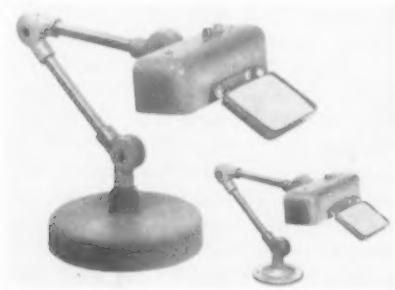
It is particularly useful for grinding accurately hard-to-reach corners and complicated shapes. Accurate corner grinding is possible throughout the service life of the wheel because of its even wear.

Preparation for welding, foundry operations, finishing welds and machine shop work are some of the applications for the new wheel. **T-7-971**

Illuminated Magnifier

A portable high intensity fluorescent fixture designed primarily for industrial inspection produces intense but cool glare-free illumination with high magnification.

Model 66SV is equipped with either a 2- or 4-power lens of 2 x 4 in. dimensions. The lens holder is hinged, offering the inspector complete versatility



of using the light with or without the lens. The lens also acts as an ideal chip shield when in use, preventing foreign material from entering or endangering the inspector's eyes. Up to 500 foot candles of intense illumination is provided yet the lamp shade never gets hot.

Model 66SV is factory-equipped with either a heavy portable cast base or for a more permanent installation, this unit can be supplied with longer arms for machine or bench mounting. The fluorescent tubes are rated at 7500 hours average life which normally represents over 3 years between lamp replacements. During this period the clean, white, glare-free illumination contributes to increased and better production with far less operator fatigue. **T-7-972**

Drill Press

An Alfing heavy-duty drill press, redesigned to meet the operating requirements of American mass-production methods, is being distributed in this country by Kurt Orban Co., Inc., New York.

Table and headstock of this heavily constructed drill press, Model BK-25, are both adjustable, facilitating quick change-over from one job to another.

Table is raised and lowered by a crank and supporting screw and locked in place by a lever. Totally enclosed headstock is moved by hand over a distance of 6 in. and is also locked in position by a hand lever. A carefully machined guide on the machine body assures accurate alignment between table and headstock.

Drilling capacity is 1 in. in steel and 1¼ in. in cast iron. Machine is also adaptable to boring, countersinking, milling and reaming. Work table measures 26 by 28 in.

The 9-in. spindle stroke is driven by either a flange-mounted or a V-belt drive 3-hp a-c motor. Eight spindle speeds are available, ranging from 150 to 1640 rpm in geometrical progression. The spindle is carried in precision ball bearings to assure drilling accuracy.

Drilling feed may be either by hand or by power. With power feed, feeds of 0.003, 0.006 or 0.009 in. per spindle revolution are available. Power feed can be engaged and disengaged at any position of the spindle. Drilling depth is set by a quick indexing stop.

T-7-981

Solid Lubricant

A stick-type wax lubricant is now being marketed by the DoAll Co. for lubrication of cutting tools, threaded metal fastenings and other metallic forming tools used in production manufacturing, toolrooms and home workshops. The product called Tool-Saver is a special formula of fine wax ingredients. It is designed to reduce considerably the friction and the accompanying heat occurring in machining operations. This facilitates better tool performance while prolonging tool life and preserving tool temper. It helps prevent detrimental abrading, scoring or burning of a tool or the work and noticeably improves surface finish on the machined material. In many cases, burrs resulting from machining are eliminated through the use of the Tool-Saver and production cost correspondingly lowered since deburring operations are made unnecessary.

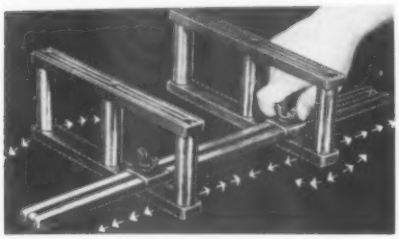
Tool-Saver is recommended for use on such tools as saw bands, knife bands, circular saws, hack saws, carpenter saws, twist drills, taps, reamers, countersinks, spinning tools, grinding wheels, sanding belts or wheels, routing tools, etc. Applied to wood screws, it greatly eases driving. When used in certain grinding or sanding operations it prevents burning and promotes good finish. It can be used to help prevent scoring of dowel pins and when used on paper or fabric drills, prevents burning of the paper or fabric.

T-7-982

Die Handler

Called Acro die cradle, a die handler safety parallel unit is announced by Acro Safety Parallel Div., 24 South Crawford Ave., Chicago 24.

This device is made of high grade steel, hardened and ground to close tolerances to assure accuracy and consists of two parallel units each 4 in. in height, 9⅞ in. in length, in the form of a frame, with center and end posts 1 in. in diameter supporting top and bottom bars of 1 in. width and ½ in. thickness; an adjusting rail 20 in. in length, 1⅛ in. wide and 7/16 in. thick (with full center slot) which joins the two parallel units together. Two bolts and two wing nuts permit quick, easy, secure sliding adjustment to any desired spread up to 18 in. Further versatility of adjustment is possible by pivoting these parallel units so that either the front or rear ends point inward or outward, at practically any required angle.



In use the Acro die cradle is set up on the work bench, drill press or wherever needed and the parallels adjusted to the desired spread for accommodating the die set, jig or other items to be worked on. Because of the height of the parallels, there is ample clearance for die guide posts or for any underneath finger manipulations.

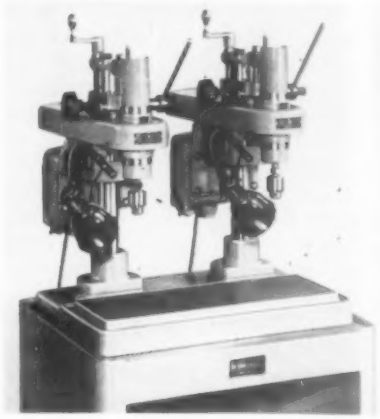
Thus, with these strong parallels, joined together by a sturdy adjusting rail, there can be no toppling over of heavy dies onto the worker's fingers, nor can there be dangerous shifting of the work, causing injury to hands while tapping, drilling or during other operations. **T-7-991**

Press Feed

An automatic hitch-type press feed for mounting on the die set or bolster plate is announced by Jaco Devices, Inc., 99 High St., Hingham, Mass. The tool is cam-operated, but does not rely on the cam to obtain or maintain accuracy of pitch. As its name implies, the Jaco grip-o-matic feed grips the stock firmly under spring pressure while being fed into the press tool but at a predetermined point before the die starts to work the material, its gripper releases and the stock is free to float in response to die pilots or metal flow requirement of forming operations. Slippage due to stock inertia is controlled, and consequently, accuracy of pitch can be maintained. On the return stroke the gripper remains open, thus insuring minimum of wear on the gripper blade and freedom from surface scratches on stock with polished finish. The device will operate from any side of the die set to which the cam is attached and will feed the stock on either the up or down stroke of the punch press ram. A ratio of 2:1 exists between the distance stock travels and the lateral movement of the cam roller; consequently, a feed length of 2 in. can be obtained on a punch press having only a 1-in. stroke. The tool will feed any thickness of coiled stock up to 3/32 by 2 in. wide.

Drilling Machines

Announcement is made by the Hamilton Tool Co., Hamilton, Ohio, that Hamilton super-sensitive, small bench, precision drilling machines are now available in single-base, multiple-spindle design.

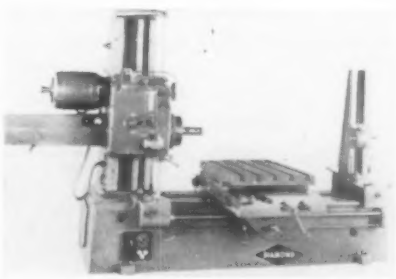


These machines have capacities of 0.004 to 5/16-in. hole diameter, clearances up to 8 in. from center of chuck to column, and up to 14 in. from base to chuck.

Adjustable stops are provided on all machines for the precision control of hole depth, and one model features spindle speeds, variable between 840 and 9300 rpm controlled by a graduated hand wheel speed dial.

The machines are offered in single-base, multiple-spindle design in response to the growing demand for high production in precision drilling. The accurate machining of the continuous base pads make the use of box fixtures feasible, thus increasing production materially with no loss in precision. Stands are also available in appropriate lengths. **T-7-1001**

Boring Mill



The Diamond Machine Tool Co., Los Angeles, Calif., has announced a 3-in. horizontal boring mill, the Diamond AL72. This machine has all the features of much larger and costlier mills. Among the features are 18 feeds with rapid traverse in all directions; infinite control of feeds on facing head; heavy 10-hp motor with amperage load regulator. **T-7-1002**

THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

LITERATURE NUMBER	COMPANY	BULLETIN	DESCRIPTION
A-7-157-1	Ace Drill Bushing Co., Inc.	1101-2	Accuracy and ultra precision of drill bushings is stressed in catalog.
A-7-125	Allegheny Ludlum Steel Corp.		"Stainless Steel Handbook" contains clear, concise fabrication data to help speed production and cut waste.
A-7-170	American Broach & Machine Co.	300	Two separate broaching operations on one machine speed production of tank track parts.
A-7-98	American Wheelabrator & Equipment Corp.	23	Closer tolerances, stronger bond, brighter appearance, and superior lubricant retention qualities—important advantages listed in bulletin.
A-7-97	F. E. Anderson Oil Co.		20-page booklet contains information on machine cleaning, maintenance of Lusol solutions, and other advantages.
A-7-127	The Atrax Co.		Complete catalog offers longer service, fewer production difficulties, more profits with Atrax tools.
A-7-158-4	W. O. Barnes Co., Inc.		38-page illustrated booklet devoted to facts, figures, tables and charts on various metal saws.
A-7-26	The Bellows Co.		Offering a group of case histories showing typical installations of Bellows Electroaire Valve.
A-7-195	Besly-Welles Corp.		Bulletin gives detailed story of accuracy and uniformity of company's machines.
A-7-189	Bethlehem Steel Co.	560	Folder offers full details on specialty steels.
A-7-196-1	Chicago Tool & Engineering Co.	10	Circular stresses accuracy, speed and fine construction of rotary, index, milling table.
A-7-16	The Cincinnati Shaper Co.	S-6 B-3	Catalogs tell how to save time and money with company's 210 series brake and 100 series shear.
A-7-113	The Cleveland Tapping Machine Co.	T-17	High production, lower costs, increased profits all possible with famous Cleveland tools.
A-7-159	Crucible Steel Co. of America		"Crucible Tool Steel Selector" available upon request.
A-7-131	The Cushman Chuck Co.	64-1952	Catalog contains engineering drawings and dimension data.
A-7-149	The DoAll Co.		"Grinder Catalog" gives complete information on line of DoAll grinders for toolroom and production work.
A-7-184-1	Enco Mfg. Co.	604	New "Mite-Mite" No. 500 Portable De-Magnetizer described in bulletin.
A-7-89	Erickson Tool	J	Catalog gives suggestions on production problems simplified.
A-7-145-1	Galland-Henning Mfg. Co.	SW-1	Efficient application and control of air or hydraulic power explained in bulletin.
A-7-20	Gisholt Machine Co.		Number of brochures and reprints outline the fine points of Gisholt machinery and equipment.—No. 12 Hydraulic Automatic Lathe; "Turret Lathes Build Turbojets"; "Continuous Crankshaft Balancing"; and "Wear and Surface Finish."
A-7-94	Golconda Corp.		Circular gives full details and prices on STA-SHARP diamond tools and catalog shows complete line.
A-7-112	Graham-Mintel Instrument Co.		Free Par-Ac bulletin shows typical applications in production gaging.
A-7-174	Grinding Wheel Institute		Various booklets offer helpful suggestions on how to improve in the use of grinding wheels.
A-7-145-3	Grobet File Co. of America, Inc.	HC1	Catalog sheet explains the advantages in using chatterless countersinks.
A-7-181	Handy & Harman	20	Bulletin offers valuable information on joint design and fast brazing production methods.
A-7-163	Hannifin Corp.	112	Complete description and specifications listed in bulletin on new universal model U.
A-7-3	Hardinge Bros., Inc.	CIF 8	Bulletins explaining the attainment of speed and accuracy in the use of collet index fixtures and chucks.
A-7-114-2	John Hassall, Inc.		New Hassal decimal-equivalent wall chart offered.
A-7-121	Howe & Fant, Inc.		Literature offered on Lign-o-matic turret for all consecutive drill press operations.
A-7-90	The B. Jahn Mfg. Co.		Production proved dies save thousands of productive hours and dollars.

USE THIS HANDY FORM ➡

to obtain further information about advertisers, trade literature or tools of today appearing in this issue of THE TOOL ENGINEER. No postage needed.

THE TOOL ENGINEER, DETROIT 21, MICH.

READER SERVICE CARD

Please send me further information as indicated below:

(Mark Key Number of trade literature, tools or advertisements)

ADVERTISERS	TRADE LITERATURE	TOOLS OF TODAY
A—	L—	T—
A—	L—	T—
A—	L—	T—
A—	L—	T—

NAME _____ POSITION _____

FIRM _____ BUSINESS _____

Please Check One ☐ Firm Address ☐ Home Address } STREET _____

CITY _____ ZONE NO. _____ STATE _____

THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

LITERATURE NUMBER	COMPANY	BULLETIN	DESCRIPTION
A-7-139	Jones & Lamson Machine Co.		Tangent and Radial Die catalogs stress dependability, accuracy and speed in the use of company's die heads.
A-7-105	The Kempsmith Machine Co.		New arbor bulletin describes complete line of arbors and accessories, and gives information on keeping arbors in condition.
A-7-100	Kennametal, Inc.	51	Greater productivity and reduced tooling costs explained in catalog.
A-7-28	Kling Bros. Engineering Works.		Free 12-page bulletin gives complete story on how Kling Friction Sawing can be profitably applied in plant.
A-7-2	Landis Machine Co.	88	Higher production, reduction of tool cost and other advantages explained in bulletin.
A-7-23	The Lapointe Machine Tool Co.	HP5	Bulletin fully describes broach-rifling machines.
A-7-32	Latrobe Steel Co.		Ease of die machining, minimum heat-treating hazard, extra toughness, superior die performance all explained in booklet.
A-7-168	Lindberg Engineering Co.	1440	For production brazing, soldering, hardening, annealing and other requirements read booklet.
A-7-145-2	Jas. H. Matthews & Co.	A-1	Clear, positive inspection marking assured by use of stock symbol designs explained in bulletin.
A-7-22	Metal Carbides Corp.	KL-52	New descriptive circular lists special advantages,—maximum support, quick adjustment and trigger action in using Klamp-lok toolholders.
A-7-167	Micromatic Hone Corp.		A complete line of honing tools for every type and size of cylindrical surface described in "Cross Hatch."
A-7-203	Miller Motor Co.	A-105 A-104	No broken castings, no scratch-damage to piston rods, bushings and seals, no costly "downtime" in using company's air cylinders.
A-7-95-1	Newcomer Products, Inc.	108	New cutting carbide and its advantages pointed out in catalog.
A-7-153-3	Oakite Products, Inc.		"Time saved with Oakite steam-detergent cleaning"—free book.
A-7-191	Ortman Miller Machine Co.		New 28-page catalog gives complete data and specifications on all O M cylinders, pointing out their application to special requirements.
A-7-126	Potter & Johnston Co.	148	High-speed, economical production of precision parts stressed in free bulletin.
A-7-192-5	J. A. Richards Co.	TE-5	Production without special tooling; savings on die cost and expensive presses listed in illustrated folder.
A-7-116	The Standard Electrical Tool Co.	TW	Pertinent information on Universal Precision protractor—tool guide with dresser given in bulletin.
A-7-138	Standard Pressed Steel Co.		Copy of UNBRAKO Standards lists time-and money-saving features.
A-7-177	D. A. Stuart Oil Co.		Booklet "More Than a 'Coolant' is Needed" shows how to attain best possible results in terms of finish, tool life and production.
A-7-9	Sundstrand Machine Tool Co.	721	Bulletin gives information concerning design features that make for increased production.
A-7-30	Sun Oil Co.		Booklet entitled "Sun Quenching Oils" points out excellent metal-wetting characteristics and other qualities of company's products.
A-7-204	U. S. Tool Co.	80-E	Bulletin gives detailed description of U.S. products—controlled accuracy, versatility, etc.
A-7-210	Waico-Strippit Corp.	TC TS	Catalogs point out dependability, simplicity of design of company's equipment; also lists valuable time-and money-saving suggestions.
A-7-157-3	Waukesha Tool Co.		Complete specifications for all models of cutting tools given in new, concise catalog.
A-7-115	Zagar Tool, Inc.	E-7	Engineering Manual offers detailed information on all Zagar's tools for industry.

BUSINESS REPLY CARD
No postage stamp necessary if mailed in the United States

FIRST CLASS
PERMIT NO. 10782
(Sec. 510, P.L. & R.)
DETROIT, MICH.

THE TOOL ENGINEER
ASTE Building
10700 Puritan Ave.
Detroit 21, Mich.

ATT: READER SERVICE DEPT.

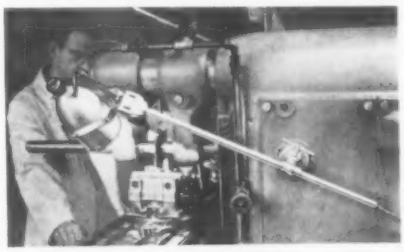
USE THIS HANDY FORM

to obtain further information about advertisers, trade literature or tools of today appearing in this issue of THE TOOL ENGINEER. No postage needed.

Machine Lamp

Announced by Bretford Mfg., Inc. is a fully adjustable machine lamp which throws a flood of light directly on working areas. The lamp is a heavy-duty type designed to eliminate maintenance except for normal replacement of bulbs.

To avoid oil damage, Textolite bearings and an oil-resistant cord with supplementary Vinylite insulation are used throughout. Further protection against electrical failure is provided by not running the cord through swivels or bearings.



The heavy gage steel reflector remains comparatively cool and will not accidentally burn the operator. A porcelain socket and special heat-resistant cord insulation with the reflector conform fully to the requirements of the Underwriters Laboratories who have approved the entire lamp.

The flexible joints provide action in three planes. The operator can make friction adjustments to lock the lamp in position for production or to permit repeated movement. An on-off switch is mounted on the reflector next to the adjustment knob. **T-7-1931**

Abrasive Wheels

Behr-Manning Corp., Troy, N. Y., Div. of Norton Co., has been instrumental in the development of a new design in abrasive belt contact wheels. This principle has been embodied in an abrasive belt contact wheel known as the rubber-rim wheel.

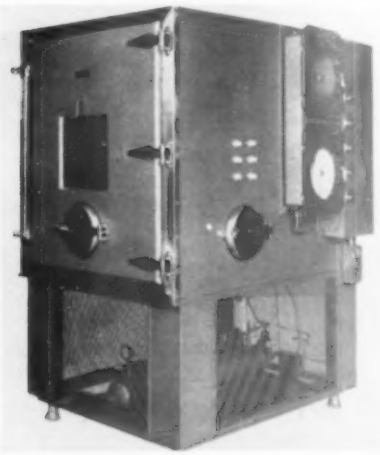
The wheel is constructed from two basic members; a steel rim onto which rubber in durometers from 10 to 90 has been molded and a set of flanges which contain the rubber rim.

The Behr-Manning rubber-rim wheels offer several advantages over the conventional solid disc wheels which are constructed of rubber molded onto a solid aluminum disc. They are lighter in weight—an important factor for required balance in high-speed roughing operations, and the rubber face can be rapidly replaced with a new rubber-rim should it be damaged or worn out. Due to the simplicity of replacing the rubber-rim, wheel costs are materially reduced over present molded rubber disc wheels. **T-7-1032**

Humidity Tester

A humidity testing cabinet with a 27-cu ft. working area recently introduced by Murphy & Miller, 1536 S. Michigan Ave., Chicago, will supply relative humidity between 20 and 95 percent in the temperature range 35-185 deg F.

Among the advantages claimed for the new unit by the manufacturer are faster temperature regulation throughout the range, and the elemination of troublesome and damaging condensation caused by changing temperatures during the course of a test.



Fast, accurate temperature regulation is assured through the use of a hermetically sealed refrigeration unit and an electric heating system, which quickly lower or raise interior temperatures to the precise degree required.

A glass viewing panel with built-in wiper, two conveniently located stainless steel hand hole ports, vapor-proof interior light, forced air circulation, adjustable shelf brackets in the stainless steel working space are standard features. In addition, 6 electrical leads are introduced into the working space of the unit to provide quick, easy connections to electrical equipment which may be under test. **T-7-1041**

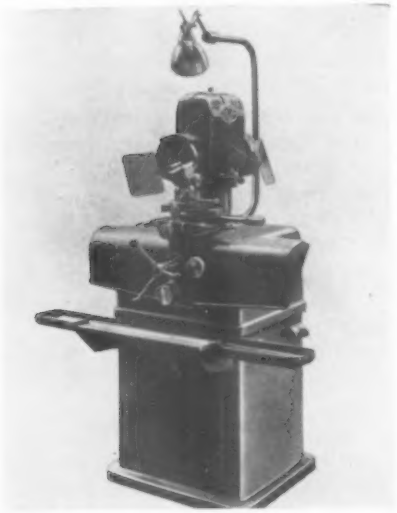
Plastic Electrical Tape

Particularly adapted to heavy-duty work, winding heavy cables, electrical harnesses and for use with power-driven taping machines, this tape is 0.010 in. thick, has great strength and flexibility and is resistant to weather, oils, acids, alkalies and corrosive chemicals. Dielectric strength averages 10,000 volts (1000 volts per mil of thickness) and because of its ability to stretch, it conforms well to irregular surfaces.

It is widely used in manufacturing and is adapted to use on power-driven taping machines in production work. It is also used in plant-methods work and maintenance operations. **T-7-1042**

Tool Grinder

H.E.B. Machine Tools, Inc., 341 Madison Ave., New York 17, exclusive distributors in the U.S. and Canada for Moteurs Constan of France, announces the new type 178 Constan carbide tool grinder is now available for prompt delivery without priority.



Representing a new concept in the sharpening of carbide tools, the machine, whose table runs on ball bearings, incorporates the results of all recent research in the field. Without any special attachments, it can be used for the grinding of all types of carbide tools, however complicated their profile. An attachment is available, however, for grinding carbide inserted-tooth milling cutters.

Since the Constan grinder has been designed especially for carbide, tools lapped on it permit higher cutting speeds and show longer life. The machine is especially convenient for all types of single-point tools, whether for lathes or planers. It may be used for grinding chip breaker grooves with great facility. **T-7-1051**

Handling System

Said to be the only materials handling system of its kind in the country, and employing hardwood construction, the Wesling System offers simplicity, flexibility, and economy of operation. It is made by Albert Wesling & Sons, Inc., 2912 West Lake St., Chicago 12.

The system is based on a master hardwood unit with inside working dimensions 24 in. long by 13½ in. wide by 2⅜ in. deep. The bottom is made up of ½-in. hardwood dowels running width-wise on 1½-in. centers. This affords sufficient support for metal parts being loaded and plenty of opening for free draining of liquids or passage of air. Slots in the ends and sides of the unit permit thousands of space combinations to be set up by using crosswise and lengthwise hardwood dowel dividers. The dividers protect the metal parts (being handled) from each other and reduce part damage and loss from chipping or denting.

Built-up sections which may be added to the master unit for parts that are too tall to handle, are the same size and construction as the master unit except that they have no dowel bottom. However, cross-dowelling for space combinations can be set up to match the master unit.

Steel corner construction which extends slightly above the top edge of each unit serves to add rigidity to the units, protects the corners from scuffing and tearing, and is a safety guide when stacking the units.

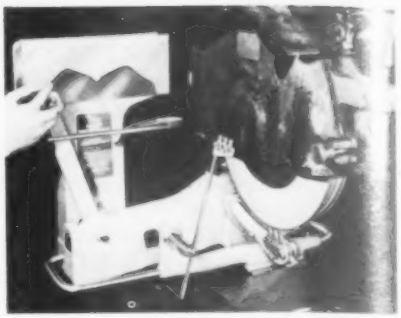
It is claimed the boxes are never obsoleted because of changes in the size of parts being produced because each unit can be rearranged and adapted to the new parts in a matter of minutes.

A peg tray which lies on the dowelled bottom of the master unit can be used for small parts such as bushings or gears. **T-7-1052**

Forming Attachment

Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn., has announced the development of a larger Diaform wheel-forming attachment, designed to simplify the form-truing of grinding wheels up to 20 in. in diameter, used on medium and heavy-duty, horizontal spindle, surface grinders. It offers a quick, accurate method of truing a given form up to 3 in. wide and 1 in. deep in one setting. The new unit, similar in design to the smaller Diaform introduced in 1949, has been designated the model 4. Basic construction is a vertical pantograph, which is operated by tracing from a 5:1 ratio templet to guide a truing diamond across the periphery of the grinding wheel.

The attachment is portable, weighs approximately 75 pounds, and is placed on the magnetic chuck or strapped to the table of the grinder. Three diamonds mounted in tandem are employed to true a new form on a wheel: one for roughing, one for semi-finishing and one for finish truing. Whereas the roughing diamond is a natural uncut stone, the semi-finishing and the finishing diamonds are chisel-shaped and precision ground to a 0.010 in. radius. A worn finishing diamond is ordinarily used for semi-finish truing, thereby extending the accurate life of the finishing diamond. The diamonds are mounted on the diamond spindle of the Diaform and a centering gage is provided to center each diamond under the grinding wheel for its respective truing operation, by traversing the machine table. **T-7-1061**



Stock Divider

In setting up a gear preparatory to grinding, it is necessary to know precisely how much eccentricity it has and to locate the high point on the pitch circle. Then it can be properly clamped on its arbor so that an equal amount of stock on each side of the high point will be presented to the grinding wheel.

This operation may be performed on the gear grinding machine, but the time required for it is unproductive machine time. The stock divider announced by National Broach & Machine Co., 5600 St. Jean Ave., Detroit, eliminates this loss by allowing the machine operator to clamp each gear on its arbor while its predecessor is being ground. Thus the only down time for the grinder is that required to unload the finished gear and immediately load the next.

The stock divider, usually located on a bench in the vicinity of the grinder, consists of movable head and tailstocks and a checking head adjustable to work-gear diameter. The latter has a removable nose piece and a spring-loaded spindle which actuates a dial indicator for reading gear eccentricity. This spindle may be locked with the nose piece either in or out of contact with the work gear teeth.

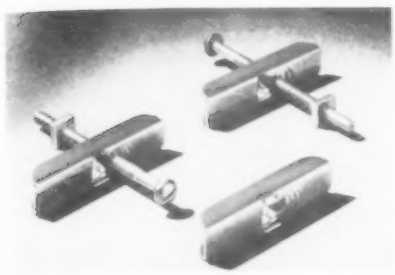
The arbor carrying the work gear is set between the stock divider centers and the arbor driving dog in contact with the adjustable locating button.

The high point is found and positioned in relation to the driving dog. Then with the nose piece still in mesh, the gear is locked on the arbor.

The stock divider may also be used for checking eccentricity and tool size of finished gears. **T-7-1062**

Toggle Bolt Assembly

A toggle bolt is now available which offers three distinct advantages not previously obtainable. Super-Grip 3-D toggle bolts may be installed with either the head of the bolt outside the wall or with the nut outside the wall



and the toggles may be purchased separately and used with any bolt. These features make possible reduced inventories because the toggle bolt is reversible in the head and provides flexibility. The toggle head is available from stock for bolt diameters from ⅛ up to ½ in.

For information, write to Super-Grip Anchor Bolt Co., Inc., 3333 N. 22nd St., Philadelphia 40. **T-7-1071**

Center Lubricant

Molykote-Centerlube, a lubricant for dead center lubrication wherever loads and speeds are beyond the capacity and temperature ranges of conventional center lubricants, has been announced by the Alpha Corp., 179 Hamilton Ave., Greenwich, Conn. It is packaged in 2-ounce tubes, 12 to a carton, and may be purchased direct.

The basic ingredient of Molykote-Centerlube is Molykote type Z, a lubricating grade of molybdenum disulfide powder which will bond a lubricating film on bearing surfaces and impart the low friction and anti-seizing properties necessary to resist extreme bearing pressures and temperatures.

Molykote-Centerlube has also been highly successful for steady rest lubrication and for reducing wear on plug and thread gages. It is also an excellent lubricant for press fitting, heavily loaded gears, ways and gibs of machine tools, and for hundreds of other tough lubrication jobs which are beyond the capacity or temperature range of conventional lubricants—especially where the danger of seizing and galling exists.

The adhesive and lubricating qualities of Molykote-Centerlube are the result of the full utilization of molecular structure of this combination of molybdenum and sulphur. **T-7-1072**

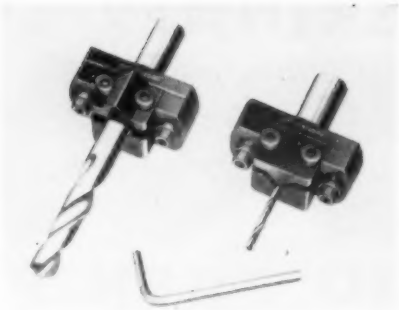
USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Tool Holder

Developed in a production shop with unusually high precision requirements, the Brookfield tool holder is designed to hold drills, counter-bores, reamers and other tools of any diameter from 1/64 to 1/2 in. without the use of accessory equipment of any nature.

Precision grinding of all working surfaces insures that the tool holder's shank and V jaw section are permanently parallel within 0.0005 in. in 6 in. Runout is actually less than 0.0001 per inch. Thus perfect tool alignment is automatic.

In use, it is only necessary to insert the tool in this axially-true jaw section and tighten the jaw screws. Dead center adjustment can then be made by floating the tool into position in the normal way and tightening the unit's locking screws.



The spherical undersides of the heads of these locking screws and the internally beveled washers into which the heads fit, provide a balanced-pressure locking assembly which maintains uniform seating and eliminates all possibility of creep or shift during tightening.

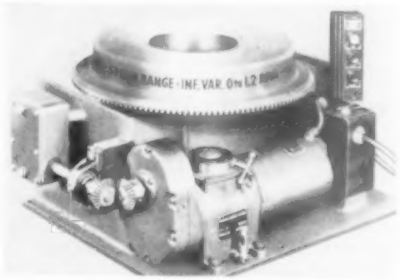
The entire unit is made of hardened steel, stress relieved, and will retain its accuracy through many years of service. Even the thrust collar is precision ground perpendicularly true to the axis of the shank, making possible solid bedding without danger of distortion.

For further information write Brookfield, Inc., 755 Boylston St., Boston 16.

T-7-1081

Turntable

The Model X-20115 Big Hole turntable is designed for mounting on a bench, the floor or a pit to rotate heavy, large diameters on the horizontal plane only for welding, painting, and cleaning.



With the 9-inch hole in the center of the turntable, spindle shafts can be positioned without special fixturing. A minimum space is taken up by its compactness. Infinitely variable speeds of the work table from zero to 1.2 rpm handle a wide range of work. Precision-cut steel fabricated gears offer a minimum of backlash for smooth precise rotation forward and reverse. A remote push-button control and magnetic reversing starter are standard equipment. Made by the Aronson Machine Co., Arcade, N. Y. **T-7-1082**

Forging Furnace

A forging furnace able to properly heat high-speed and alloy chisels for forging and hardening, and provide true cold-shank heating has been announced by the Delaware Tool Steel Corp., Wilmington 99, Del.

A new principle, which confines heat to the chisel point, prevents loss of temper in the shank during tool redressing. Thus, shank breakage is virtually eliminated in tool use. In most cases, the shanks remain cool enough to forge without tongs, permitting greater speed and accuracy.

Forgeatrol furnaces provide fast, uniform heating controllable between 1200 and 2800 deg F., allowing one furnace to be used for both forging and hardening. This accurate heating means longer tool life and makes the economies of high-speed chisels practical for any plant.

Models are furnished in several sizes, with manual or automatic controls. **T-7-1083**

Remote Handler

Tracerlab, Inc., has developed a magnetic remote handler to make possible the easy positioning and manipulation of radioactive sources, encased in ferromagnetic materials, with increased safety for radiographers, it was announced recently.

Weighing only 2 lb. 15 oz. the E-32 remote magnetic handler is constructed of feather-light aluminum tubing and has a 12-in., chrome-plated, flexible gooseneck leading to a short, stainless steel tip. A permanent Alnico magnet is encased in the tip and a cast aluminum grip, curved to fit the hand, is depressed to withdraw the magnet from the inner surface of the tip and thus release the source.

Personnel safety from radioactivity is largely based on three inter-related factors: length of exposure, shielding and distance from the source. The new handler, the company said, makes it possible for radiographers to keep a safe distance and thus provides a higher degree of protection. The new handler is stocked in a standard 6-ft. length. **T-7-1091**

Air Line Filters

The C. A. Norgren Co., 3400 So. Elati, Denver, announces a filter for removal of corrosive moisture, abrasive pipe scale and other foreign matter from $\frac{3}{4}$ and 1 in. compressed air lines. It is for use on air flows of from zero to 140 cfm at pressures of zero to 150 psi and temperatures between 40 and 120 deg F.

The transparent plastic bowl, which holds one pint below the baffle, enables you to see when to drain—done by simply opening the drain cock. The bowl is easily removed for cleaning or replacement. The filter is fully automatic and requires no adjustments. One of the important features of this new filter is the special baffle plate which traps the moisture and solids in the bottom of the bowl where they cannot be drawn back into the air line.

More efficient filtering is obtained by use of Louver entry ports and deflector ring which set up a centrifugal force that wrings a higher percentage of moisture from the air. Three types of filter elements are available. Reinforced 200-mesh (74 microns) Monel metal screen is standard. Twenty-five and 64-micron sintered metal filter elements can be furnished. **T-7-1092**

Valve Drives

A line of automatic gate valve drives designed for use in connection with gate or angle valves in pipelines carrying intense pressure has been announced by Janette Electric Mfg. Co., subsidiary of Gerity-Michigan Corp., Morton Grove, Ill.

A regular line of the gate valve motors ranges from ⅛ to 10 hp, and includes a special line ranging up to 50 hp. T-7-1101

Electronic Timer

General Control Co., Boston 34, has developed a Promatic electronic timer capable of controlling timed operations between 60 milliseconds and 60 seconds.

The discharge of a resistor-capacitor network through a sensitive gas tetrode relay tube provides the basis for each timing period, the duration of which may be manually set by a potentiometer. Steps within the overall timing range are adequately covered by plug-in condensers.

The time period is set manually by means of the indicator and the large 3⅜-in. dial. Timing commences upon closure of any external switch; control

contacts either open or close at end of timing, depending upon actual circuit requirements. Control contacts are double-pole double-throw, rated at 10 amperes, 125 volts ac, non-inductive. Operation is from 115 volts ac or 220 volts ac, 60 cycles.

Similar in appearance to the synchronous-motor timer for timing periods between ½ second and 24 hours, matched timer housings are now available for use in dual-timer applications. These timers may be mounted back-of-panel, against a wall, or in the rear of a cabinet. Wide-spaced barrier strips may be located either on the front or the back of the timers.

Typical applications include automatic process control, machine tools and molding machines, for laboratory life tests, etc. T-7-1102

Metallograph

A desk-type metallograph permitting microscopic study of metals under polarized light as well as phase and bright field illumination is announced by American Optical Co., Instrument Div., Buffalo 15.

The model 2400P metallograph retains all the design advantages which have made the standard model 2400A so popular. From start to finish every operation may be performed while sitting comfortably at the desk. Every control is in easy reach. Final focusing for photography is accomplished quickly, automatically and accurately while examining the specimen through the parfocal visual system.

A quadruple revolving nosepiece permits rapid change of objectives. The automatic, motor-driven arc lamp is adjusted easily and accurately. A separate, built-in illuminator is used for visual examination. Four special built-in photographic eyepieces operate in a quick-change slide.

The research-type centerable rotating stage has verniers graduated in degrees, and built-in coordinate motions, 20 mm in each direction. **T-7-1111**

Fortified Lube Oil

Shell Rimula oil, featuring a combination of additives not before attained on a commercial basis, is substantially extending the serviceable life of industrial and materials handling trucks, gasoline engines operating in door-to-door, intermittent type service, as well as some industrial automotive type diesel engines employed in a wide group of industries for stationary and mobile power. Extensive tests have shown that this highly fortified oil cuts down engine wear from corrosion and fouling, with consequent reduction of oil consumption and frequency of costly overhauls.

One company manufacturing gasoline-engine fork lift trucks used Shell Rimula oil to eliminate objectionable exhaust smoking and incidentally found that engine life was thereby doubled because of cleaner engine operation.

The oil was developed by Shell Oil Co. to solve certain problems of engine wear and fouling caused by certain operating conditions that are aggravated by low loads, high sulphur fuels and intermittent service. Its advantages have been found most pronounced in those diesels designed for increased power output on low-grade fuels.

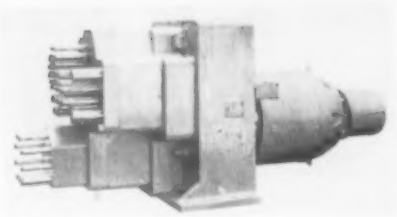
T-7-1112

Lead Screw Tapper

The United States Drill Head Co. of Cincinnati, has recently designed and built this special tapping head to operate in conjunction with two additional lead screw tapping heads on a three-way machine.

Individual lead screw tapping heads can tap holes regardless of different threads, fine or coarse, small or large diameters, in the same head as each tap has its own lead screw, the lead of which is identical with the tap.

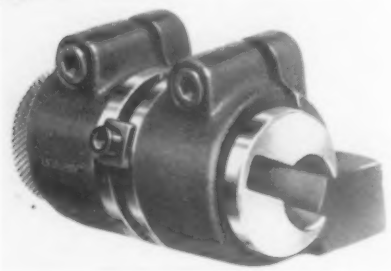
This particular head performed the tapping of $\frac{5}{16}$-in.-18, $\frac{3}{8}$-in.-16, $\frac{1}{8}$-in.-27 taper pipe, $\frac{3}{8}$-in.-18 taper pipe, and $\frac{3}{4}$-in.-14 taper pipe holes in an aluminum accessory case. A class-three thread was required. The $\frac{3}{4}$-in.-14 taper pipe taps operated at 90 sfpm. The maximum stroke of the spindles varied with the requirements of each hole to be tapped. The maximum stroke was $3\frac{1}{8}$ in. By means of a rotary gear-type limit switch, the stroke was reduced to a minimum working stroke in order to obtain a minimum time cycle. The time cycle of the head was eight seconds. This time, plus the loading and unloading time, would result in an estimated production, at 80-percent efficiency, of 97 pieces per hour. Each spindle of the head was furnished with the U. S. Drill Head patented safety tap holder. With this type holder there was eliminated tap breakage due either to the tap bottoming or striking a solid surface where a hole has not been drilled. In such cases the tap holder becomes stationary while the main portion of the spindle and lead screw continue to rotate and advance. When the lead screw is reversed, the tap holder automatically returns to its original position. This automatic feature removed a burden from the operator as the tap is always in the proper position for the next workpiece.



T-7-1113

Turret Lathe Holders

This EveredE boring bar tool holder is designed to save time and labor in setting-up. The EveredE turret lathe tool holders, by means of an eccentric barrel which can be clamped quickly into the desired or required position, provide for quick, easy adjustment for centering of boring bar, firmly maintains its precision setting, and always keeps the boring bar truly horizontal regardless of the size of lathe used within specified limits.



Adaptable to various-sized lathes, the holder also does away with shimming or grinding-down of bars. Supplied with bushings, the holder accommodates various sizes of straight shank boring bars including the EveredE boring bars that utilize exclusively HSS or solid carbide triangular shape-tool bits.

Made by the Everede Tool Co., 2000-PR North Parkside Ave., Chicago 30.

T-7-1121

Bearing-type Seal

A positive, two-piece bearing-type seal to prevent oil leakage from rear main bearings of automotive engines has been developed by the Brummer Mfg. Co., Chicago. The seal is made of Hycar American rubber, a product of B. F. Goodrich Chemical Co.

This seal replaces rope or wicking seals as well as incorporating a new technique in shaft sealing. The oil-resistant Hycar is precision-molded into a lip-type seal on a half-circle U-channel metal band. By fitting two of these half-seals around the crankshaft and tightening together, a positive oil seal is obtained. The assembly is similar to that of the bearings.

The metal base of the seal prevents distortion and the rubber covering is molded to tolerances as close as the bearings and grind of the crankshaft. The ends of each half-seal are finely ground to form a perfect circle when assembled around the shaft.

Engine speeds up to 4800 rpm mean high temperatures and severe abrasion. Hycar rubber resists the damaging effects of temperature changes, abrasion, automotive oils and greases with added detergents, and engine acids.

T-7-1122

Abstracts of Foreign Technical Literature

By M. Kronenberg

Great Britain: Two hundred percent increase in cutting speed and five hundred percent increase in feed rate are possible in milling operations by the use of milling cutters with 34 deg radial rake and 10 deg axial rake instead of conventional high-speed steel cutters to an article in the British edition of *Machinery* of April 24.

It is also claimed that the cutter life is very good, that good surface finish and dimensional accuracy are obtained when using the high rake cutters. An essential requirement for the application of these cutters is a copius flow of coolant in order to keep the thin-section tip of the teeth cool. The chips which are produced usually are closely curled and have a tendency to become wedged in the corner of the teeth when milling slots. This drawback can be overcome by a jet of coolant or of compressed air. The article contains numerous examples of production practice and diagrams illustrating the results obtained.

The scarcity and high cost in the U.S.S.R. of abrasives suitable for grinding carbide tools have tended there to restrict the use of such materials according to an article by W. N. Ulinin in the British edition of *Machinery* published May 1.

For this reason investigations have been made at one of the Russian Institutes of Technology of methods of sharpening carbide tools by an electric spark method which does not entail the use of abrasives. The process consists substantially in exposing the tool to the surface of a rotating conductive disc or drum and passing electric current (dc) between them. The tool is connected to the positive lead and the revolving drum to the negative lead. A coolant is supplied to the working zone in addition.

The highest rate of metal removed from the tool was obtained at about 2000 ft/min surface speed of the electrode-disc, although practical experience indicated an optimum speed of 2400 to 3000 ft/min in the case of finishing operations.

The electrode is preferably made of aged cast iron except when profile tools are to be sharpened for which steel or copper electrodes are preferred. The tool is oscillated relative to the elec-

trode disc during the sharpening here by the direction of rotation must ways be against the cutting edge. Th gap between the tool and the face the electrode disc should be about 0004 in. and 0.0012 in. between toc and periphery.

Actual grinding time for a tool of 0.8 by 1.2 in. in section is 3½ m s. as against 4½ to 5 min. for conve ional grinding. The cost is 30 to 50 p cent less, rendering the process partic larly useful in the case of sharpening form tools, chasers, milling cutters and the like. It is also claimed that the life of the tools sharpened by the electric spark method is about 12 percent greater than those ground conventionally and that the surface finish is likewise better.

Leonardo da Vinci, the genial painter and artist who was born 500 years ago this year, was also one of the earliest tool engineers of mankind. In the Leonardo da Vinci Quincentenary Exhibition in London there are many drawings illustrating his work in the field of natural sciences and technology which are discussed at great length by K. R. Gilbert in *Engineering* of May 21.

There are some 5000 papers of notes written over a period of 30 years covering machine tools, jacks, furnaces, cranes, war machines, printing presses and others. Although we think of Leonardo principally as an artist whose genius extended into other spheres, it is true that his primary occupation was engineering.

One of his most brilliant inventions was a screw cutting machine; in his use of lead screws and change gears he anticipated the work of Henry Mandslay who is usually credited with this invention.

The author of the article calls attention to an error in the details of Leonardo's drawing which shows both lead screws with left-hand threads instead of with threads of opposite hands. Apparently Leonardo did not give attention to this detail in a drawing which he may have regarded as a "record of invention." He has also designed boring machines, grinding machines, gears and tapping tools.

Switzerland: The recent issues of technical papers in England, and also in Switzerland, are giving quite some publicity to metal-cutting research and similar development taking place behind the Iron Curtain, as witnessed by the above article published in England and by three more such publications which were condensed by H. Pfister for the Swiss magazine *Industrielle Organisation* No. 5, 1952.

Although these papers do not reveal any startling development they may give some indication of the present

cutting research in U.S.S.R. as it may be published there.

first paper, by A. A. Avakov, with an analytical investigation at transfer between chip and work-The author has developed a ula indicating that the heat flow the chip into the work decreases increasing cutting speed, but in-es with depth of cut, feed rate and mal conductivity. The effect of the is considerably greater than that any of the other quantities men-ned. It is also claimed in this article 50 percent of the heat is dissipated the tool. This is different from pre-ious findings here, according to which percent of the heat goes into the hip, leaving only 25 percent for tool and workpiece combined.

Plastic deformation of chips produced in the machining of steel was studied by W. W. Kusjuschin. He investigated the microstructure of the chips and determined a coefficient of deformation which changes with cutting speed and shear angle of the chip.

Another such article refers to the geometry of the cutting edge and to the dimensioning of chip breaker plates in clamp-down toolholders. The authors Samoilow and Riwkinin indicate that the cutting force itself is sufficient for holding the tip in place and that this permits the elimination of brazing of the tip. It is however necessary to grind the tool correctly and to fix the hold-down or chip-breaker plate by a spring supported finger. The illustration explaining the action of the cutting force components, however, is only two dimensional and thus does not take into consideration possible displacements by the feed force of the tip which apparently is not supported in this direction.

Germany: A method has been developed by C. Ballhausen for determining graphically the properties of carbide tools as outlined in *Stahl & Eisen* of April 24. The method makes use of a three dimensional representation whereby such data as cutting speed, hardness, modulus of elasticity, thermal expansion and others can be plotted with regard to the volumetric ratio of tungsten carbide to titanium carbide and of the Co content, which are significant data for the manufacture and use of carbides. H. Opitz and J. Kob have published in *Werkstatt und Betrieb* No. 3, 1952, information on cutting forces and cutting temperatures occurring in milling operations at cutting speeds as high as 4000 ft/min when machining different types of steel. They have also studied the changes taking place in the "shear type chip" and the "flow type chip," and employed feeds up to 0.160 in. and depths of cut up to 0.320 in.

North East West South IN INDUSTRY

John K. Beidler has been elected a director of **Dravo Corp.** at the company's recent annual meeting. Mr. Beidler, who has been associated with Dravo since 1935 has been general manager of the company's Machinery Div. for the past two months. He also was elected a director and vice-president of Dravo-Doyle Co., a subsidiary.

Edward J. Girk has been appointed president of the **Torit Manufacturing Co.** by the company's board of directors. Mr. Girk, who succeeds **Arthur E. Swanson**, has been vice-president in charge of sales and advertising for several years. Mr. Swanson became chairman of the board.

M. E. Merchant, senior research physicist at Cincinnati Milling Machine Co., is the new president of the **American Society of Lubrication Engineers** following the election held during that organization's recent annual meeting. At the same time, **W. E. Campbell**, who is in charge of research and development in lubrication and organic analysis, Bell Telephone Laboratories, was elected vice-president at large; **W. H. Fowler, Jr.**, chief industrial lubrication engineer, Pure Oil Co., was named secretary-treasurer; **W. P. Youngclaus, Jr.**, former regional manager, industrial division of Alemite division, Stewart-Warner Corp., was made administrative secretary.

According to a company announcement **Bennett D. Jones**, metallurgist at **Standard Pressed Steel Co.** since 1944, has been made manager of product development. The post was only recently created in order to speed up development of new products.

At the annual and organization meeting recently, the board of directors of **Allied Products Corp.** advanced **Ralph Hubbard**, to chairman of the board. Mr. Hubbard had been president of the organization since 1939 and a director since 1928. At the same time, **Frank H. Bishop**, who has been executive vice-president, was elected president as well as director.

Frank H. Bishop

Harry F. Vickers

Two officials of **Vickers Inc.**, subsidiary of **The Sperry Corp.**, were advanced at the recent Sperry directors' meeting. **Harry F. Vickers**, founder and president of the company bearing his name, was elected president of The Sperry Corp. **Kenneth R. Herman**, vice-president and general manager and a director of Vickers was elected a vice-president of Sperry. Both men will continue in their present capacities, in addition to their new responsibilities.

Carl F. Jensen, formerly central district sales manager, has been named as manager of **Shakeproof Inc.'s** new Special Stampings Dept. Shakeproof is a division of Illinois Tool Works.

Edward O. Boshell, chairman of the board and president of the Westinghouse Air Brake Co., has been elected a director of the **Westinghouse Electric Corp.**

Also among recent announcements from Westinghouse was the naming of **J. C. Fink** as engineering manager of industrial products. Mr. Fink, who formerly was assistant to the vice-president in charge of engineering, will coordinate the engineering activities of all the industrial products divisions.

At the same time **Myron Ceresa** was appointed manager of electroplating projects for the Special Products Development Div. Mr. Ceresa, who has been with Westinghouse since 1937, will be in charge of laboratory operations, including development, pilot plant and technical service work.

Rockwell Manufacturing Co. has announced the appointment of **Charles C. Reiff** as chief engineer of the company's Barberton Div., and **Bernard Last** to succeed him as project engineer of the lubrication department. In his new position, Mr. Reiff will be responsible for the engineering and manufacture of Nordstrom valves. Mr. Last, who joined Rockwell two years ago, will be responsible for development of a wide variety of lubricating equipment.

Two appointments have recently been announced by **AiResearch Manufacturing Co.**, division of The Garrett Corp. **S. K. Andersen**, a pioneer in development of aircraft heat transfer and cabin pressure products, has been promoted to chief engineer of the company. **Ivan Speer**, formerly products engineer, has been named engineering manager of the company.

The appointment of **Chester L. Shaw** as works manager of the **Detroit Broach Co.** was recently announced. Mr. Shaw previously was associated with Ross Gear & Tool Co. where he was director of industrial relations, chief industrial engineer and assistant to the president of the company.

John D. Judge has been appointed president of **Tube Reducing Corp.** to succeed the late J. J. White. Mr. Judge has been with the company since 1948.

William A. Sipprell, Jr. will become president of **Cleveland Welding Co.**, subsidiary of **American Machine & Foundry Co.**, on July 1 to succeed retiring Harry W. Kranz. Mr. Kranz, who has been president of the firm for the past quarter century, will continue as a director. Mr. Sipprell comes to Cleveland Welding from H. & B. American Machine Co. where he was president and chairman of the board of directors.

OBITUARY

Charles G. Johnson, inventor of screw-thread gaging devices, died recently in New London, Conn., after a short illness. He was 82 years old.

Mr. Johnson, came to the United States from Sweden in 1890 and retired in 1930 when his business, **John-Sons Gage Works**, was acquired by **Pratt & Whitney Div.**, Niles-Bement-Pond Co. He is survived by his three sons, Paul, Stanley and Clinton Johnson, of the Johnson Gage Co.

John Jay White, founder and president since 1929 of **Tube Reducing Corp.**, died recently at the of 69. Mr. White's long career in the field included the presidency of Universal Pipe & Foundry Co., and later the presidency of B. Nicoll & Co. which office he retained until his death.

Douglas O. Yoder has been elected president of **The Yoder Co.**, effective July 1, to succeed **John I. Lucas** who is retiring. Mr. Lucas, who has been with Yoder since 1935, first as sales manager, then as vice-president, has served as president since 1945. Mr. Yoder started with the firm in the factory in 1935 later worked in nearly every department. He was made assistant to the president three years ago.

A number of changes in the executive staff of **Fansteel Metallurgical Corp.** have been announced following the board of directors' recent annual meeting. **Robert J. Aitchison** was elected chairman of the board of Fansteel and its subsidiary, **Vascoloy-Ramet Corp. Dr. Frank H. Driggs** was elected president both of Fansteel and its subsidiary, **Weiger Weed & Co.** He formerly was executive vice-president. **Dr. R. Winchester** was named to succeed Dr. Driggs with title of director of technical division. Dr. Winchester has been a member of the technical staff since 1937.

Also included in the announcement was **Herbert B. Clark** as president of Vascoloy-Ramet. Mr. Clark has served successively as sales manager, general manager and member of the board of directors. **Harry W. Highrighter** who joined Vascoloy-Ramet in 1940 and became its technical director in 1946 was made vice-president.

Three other newly elected vice-presidents included **Glen Ramsey**, formerly general manager of Fansteel's recently created rectifier-capacitor division. **John Meade** was named vice-president in charge of industrial relations, and **Henry D. Weed** was elected vice-president and general manager of Weiger Weed & Co.

Good Reading

A GUIDE TO SIGNIFICANT BOOKS AND PAMPHLETS OF INTEREST TO TOOL ENGINEERS

MACHINE DRAWING, *by Dean Lent. Published by Prentice-Hall, Inc., New York. 560 pp; price, $7.75.*

A handbook for the draftsman as well as a text for the student, this new book on machine drawing emphasizes the procedures in developing the design and working drawings for a new machine. It also serves to orient the user to industrial procedure.

The text outlines the development of a machine from the design through the detail and assembly stages to the point of starting production. Basic techniques and elementary theory are treated in detail, but slanted toward their application in actual drafting practice. Throughout the book, an effort has been made to make the work interesting and the procedure logical.

Fundamentals of drafting techniques, principles of projection, and conventional representation are presented. A particularly thorough treatment of dimensioning is given from basic rules through problems in mass production with the accent on clearness and utility. No prerequisites are needed. The fundamentals of drawing are covered simply and logically. The test is well illustrated and more than the usual amount of space is devoted to the machine tool process.

DESCRIPTIVE GEOMETRY, *by Harold Bartlett Howe. Published by the Ronald Press Co., New York. 332 pp; price, $4.00.*

In this textbook the direct-method approach is used instead of the earlier plane-trace method. This procedure makes the theory of the subject more interesting and enables the student to master the contents more readily. Pictorial sketches are used instead of a plethora of textual material, which stimulates the student's capacity to perceive and to visualize, and requires him to express his space conceptions in picture form. His ability to sketch space pictures is gradually built up in steps that progress from simple fundamentals to more complicated combinations. This plan gives a clearer comprehension of principles in a shorter time, which in turn makes possible a broader coverage of the subject.

One important result of this method of presentation is that it teaches the student to express his ideas in pictorial form by developing his sketching.

Technical Shorts . .

SOME IMPORTANT techniques have been developed which may result in drastic reductions in current costs of metals production. The processes involve treatment of ore concentrates by chemical methods instead of the usual smelting and refining techniques to produce pure metals. Information about the findings was announced recently by Major Gen. William N. Porter, president of Chemical Construction Co., which has been doing the research. He said that several of the applications already are scheduled for commercial use.

Although groundwork was laid through extensive fundamental research and development work in the metallurgy field for the techniques, commercial applications required specific technical adaptation and pilot-scale data for engineering design, Maj. Gen. Porter explained. For example, seven years of research by Chemico, a unit of American Cyanamid Co., was followed by four years of research and pilot plant work by Sherritt Gordon Mines Ltd. and produced a nickel-copper-cobalt process for the latter company's Lynn Lake properties. Again, in view of the country's urgent need for cobalt, processes were tailored for the cobalt concentrates of the Howe Sound Mining Co. and the National Lead Co.

First commercial use of one of the processes will begin this summer when Chemico expects to complete the building of a $2,500,000 cobalt refinery for Howe Sound Mining Co. near Salt Lake City. This plant, it is estimated will boost world output of that metal more than 40 percent, or to a yearly production of about 2,000 tons of pure cobalt. At present most of the cobalt comes from central Africa.

In addition, a $5,000,000 refinery at the Fredericktown, Mo., mine of National Lead Co., is scheduled for completion in mid-1953.

Another vitally important outcome from the research that may soon find commercial application is a new process for production of pure copper powder from any form of copper scrap, brass scrap or blister copper. Claimed to be better than 99.9 percent pure, the product should meet all standards for oxygen—free, high—conductivity electrolytic copper. Although development difficulties resulted from the complex chemistry involved, the process finally was accomplished by Chemical Construction during two years of close collaboration with Chemetals Corp.

In outlining the processes, Maj. Gen. Porter explained that refiners using them will prepare a concentrate of the ore by conventional flotation methods, introduce the concentrate as a slurry into an autoclave along with water and an acid or ammonia, and then, from the resulting leach solution, recover the individual metals by the use of suitable reducing agents. By varying conditions during the treatment, the different metals in the ore are produced separately as pure powders, which may be pressed into forms ready to market, or, in the case of copper, extruded as rods or pipe. The reagents are generally recovered.

The obvious cost advantages resulting from the possibilities of closer integration of time since it is only a matter of hours between mining of ore and the production of pure metal, are said to be supplemented by yet other economies. Smelters and refineries now often hundreds of miles apart necessitate production lags resulting in huge inventories. Further, cost of maintaining the inventories also is complicated by the hazard of forecasting future prices.

TRADE LITERATURE

Free Booklets and Catalogs Currently Offered By Manufacturers

Sanding

"Better, Faster Finishing for Production and Maintenance Jobs," dealing with industrial sanding applications, presents information on advantages of straight-line sanding action, illustrations showing how air sanders are used for multiple operations in the plant, and lists specifications on four models of air sanders and accessories. Bulletin 2109. Pneumatic Div. of **Sundstrand Machine Tool Co.**, Rockford, Ill. **L-7-1**

Air Valves

Brochure, Section 303, offered to design engineers as file on air valves suitable for pressures up to 150 psi; descriptions of each of 19 models include working drawings, specifications for sizes and cut-away views to facilitate layout of circuits by the engineer; features simplicity of design to minimize maintenance and other advantageous points. **Rivett Lathe & Grinder, Inc.**, Brighton 35, Boston. **L-7-2**

Stampings

Widely illustrated brochure describes De-Sta-Co.'s range of production equipment for high volume, intricate precision stampings; tells about range of equipment, advantages, limitations, specialties and other pertinent details. **Detroit Stamping Co.**, 328 Midland Ave., Detroit 3. **L-7-3**

Carbide Grade Chart

Designed as aid to carbide users, chart lists various specific applications with manufacturers' recommendations of the most suitable grades of their own products. Prepared as a result of survey made by the Carbide Industry Standardization Committee; covers chip removal, wear and impact applications. **Adamas Carbide Corp.**, Box 149, Harrison, N. J. **L-7-4**

Automatic Gaging

Illustrated 20-page bulletin shows various types of automatic gaging methods and gages including those for continuous measuring, all of which employ electro-mechanical and electronic systems, for high-speed work; permits study of various gages and their applications in many types of work. **Federal Products Corp.**, 1144 Eddy St., Providence 1, R. I. **L-7-5**

Babbitting

Pocket-size booklet 146, "Hints on Babbitting Practice," outlines basic steps for prevention of common bearing failures covering phases from the choice of metal for particular bearing application through correct pouring practice and in-service maintenance. **Federated Metals Div.**, American Smelting and Refining Co., 120 Broadway, New York 5. **L-7-6**

Jigs, Fixtures

Jig and fixture components from five manufacturers are included in a "Comparison Chart" which tabulates comparative catalog numbers of 11 types and 71 sizes of these items for easy, quick reference. **Northwestern Tool & Engineering Co.**, 122 Hollier Ave., Dayton 3, Ohio. **L-7-7**

Die Casting Lubricants

Illustrated folder "Houghton's Die Casting Lubricants" deals with their proper dilutions and applications in connection with various types of zinc and aluminum die casting operations; stresses efficiency and economies and other production advantages. **E. F. Houghton & Co.**, 303 W. Lehigh Ave., Philadelphia 33. **L-7-8**

Dust Control

Twenty-eight page bulletin 909A, "The Control of Industrial Dust," describes Pangborn dust control and its many applications; photos and performance data indicating savings accompany case histories of users of the equipment. Construction details, specification and dimension lists plus application and engineering data tabulations included. **Pangborn Corp.**, Hagerstown, Md. **L-7-9**

Pressurized Coolant

Four-page folder explains the recently developed "Atom-Lube" system to aid the cooling and lubricating of cutting tools efficiently and economically; various qualities and advantages of the system as well as other pertinent information regarding installation, operation and maintenance included. **The Henry G. Thompson & Son Co.**, New Haven 5, Conn. **L-7-10**

Rivet-Setting

Informative brochure 352, "Operating Instruction Manual for Automatic Setting Machines," contains details on care and operation of automatic rivet-setting equipment, operation and adjustment of the Horton non-repeat clutch (with an exploded diagram of the clutch for clarification) and the care and operation of automatic spot setting equipment. **The Milford Rivet & Machine Co.**, Mildford, Conn. **L-7-11**

Silicones

Brochure "What's a Silicone?" presents a general answer to this question as well as specialized answers such as discussions of silicone polishes, water repellents, fluids, release agents, lubricants, defoamers, Silastic, protective coatings and electrical insulation. Well illustrated. **Dow Corning Corp.**, Midland, Mich. **L-7-12**

Gear Quality

Paper on "A Practical Approach to Gear Quality" clarifies data required to specify and test spur and helical gears; and outlines minimum information necessary for intelligent approach to their testing. Chart and diagram illustrations help explain principles involved. **Eastman Kodak Co.**, Industrial Optical Sales Div., Rochester 4, N. Y. **L-7-13**

Reference Charts, Steel

Reference charts give specification designations, analyses, physical properties and heat treatments for 32 Circle L casting materials; one chart covers stainless, corrosion and heat resistant alloys, and the other deals with carbon and low alloys. **Lebanon Steel Foundry**, Dept. R, Lebanon, Pa. **L-7-14**

Die Blocks, Die Steels

Eighty-page pocket-size handbook describes eight types of Heppenstall prehardened and annealed die steels, tells the recommended application of each, and gives detailed instructions for heat treatment of the annealed types; also describes other products of the company, illustrated with photographs and diagrams; in addition includes helpful tables such as comparative hardness, draft angles for die blocks, shrink chart, decimal equivalents, temperature conversion chart and others pertinent to the subject. **Heppenstall Co.**, 4620 Hatfield St., Pittsburgh 1. **L-7-15**

Abrasives, Coated

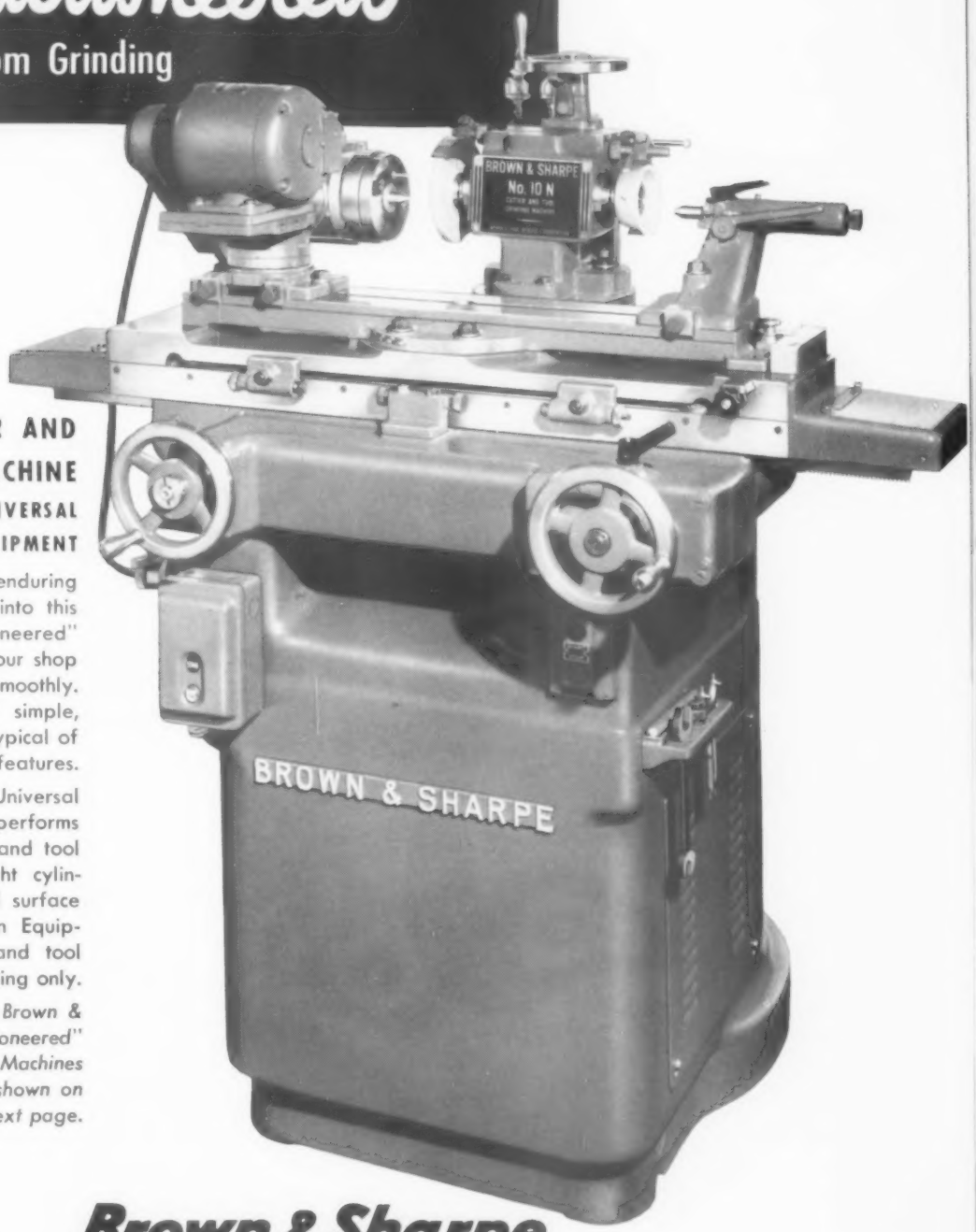
Booklet explains best way to store coated abrasives to prevent deterioration and improve length of service; stressing reasons for control of temperature, humidity and air circulation. **Armour and Co.**, Coated Abrasives Div., Alliance, Ohio. **L-7-16**

Industrial Chilling

Catalog sheet describes company's model W-120-H industial chilling machine especially designed for small heat treating departments, laboratories and other small scale users of industrial chilling. **Sub-Zero Products**, 3928 Reading Rd., Cincinnati. **L-7-17**

B·S **Productioneered**

for Toolroom Grinding



NO.10N CUTTER AND TOOL GRINDING MACHINE

WITH UNIVERSAL OR PLAIN EQUIPMENT

Simplicity, flexibility and enduring accuracy are engineered into this machine . . . it is "Productioneered" to keep machines in your shop producing fast and smoothly. Roller-bearing table and simple, convenient controls are typical of many easy-handling features.

The No. 10N with Universal Equipment (illustrated) performs complete cutter and tool sharpening, plus light cylindrical, internal and surface grinding. With Plain Equipment, cutter and tool sharpening only.

Other useful Brown & Sharpe "Productioneered" Grinding Machines are shown on next page.

Brown & Sharpe

B·S Productioneered
for unusually broad utility

No.13 UNIVERSAL AND TOOL GRINDING MACHINE

Most versatile of the Brown & Sharpe grinding machines, this model is designed primarily for broad utility in the toolroom — but can also be speedily set up to care for limited over-flow of manufacturing work.

B·S Productioneered
for quick sharpening of tools and cutters

No.5 CUTTER AND TOOL GRINDING MACHINE

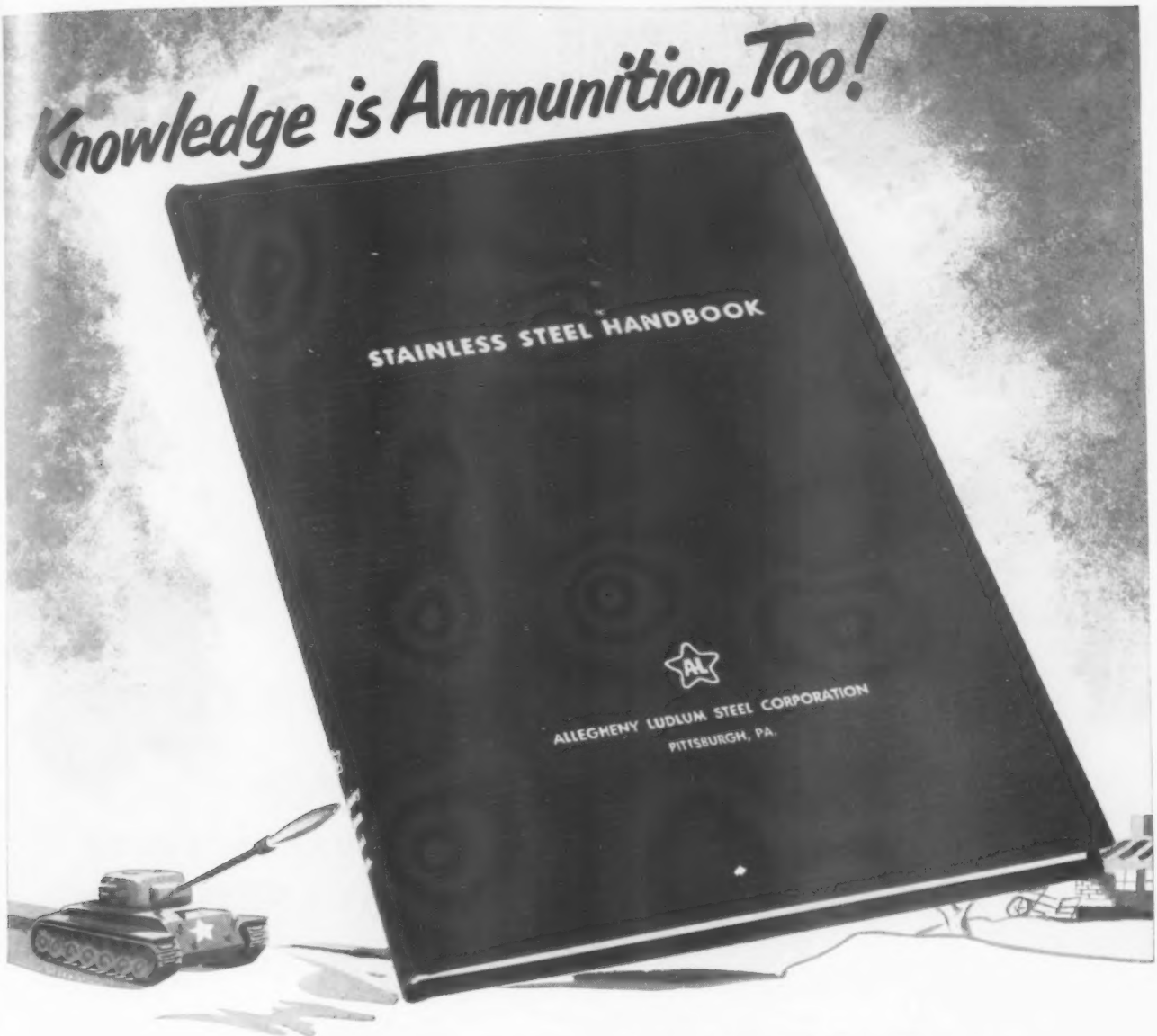
Especially designed for fast, efficient sharpening of cutters and tools — particularly smaller cutters and end mills. Additional equipment is available to further speedup sharpening in quantity.

Write for specifications of these machines or information on any other Brown & Sharpe product. Brown & Sharpe Mfg. Co., Providence 1, R.I., U.S.A.

Brown & Sharpe B·S

Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories
Machinists' Tools • Johansson Gage Blocks • Electronic Measuring Equipment • Permanent Magnet Chucks • Pumps

PRINTED IN U.S.A.



Here's 124 Pages of Valuable Data on STAINLESS STEEL

Stainless steel is a critical rearmament material. As the nation's mobilization program shifts into higher speed, supplies of this vital alloy are becoming increasingly restricted. If you're using stainless, be sure you make every pound go as far as possible.

Allegheny Ludlum's new 124-page, case-bound Stainless Steel Handbook is ready for distribution now. It will help you to select the right stainless steel and to use it right. Comprehensive listings of analysis, properties and characteristics of each type will guide you in specifying grades that will do your job most efficiently. Clear, concise fabrication data will help you speed production and cut waste.

Your copy of the Stainless Steel Handbook will be sent—*without charge*—upon request. Our only stipulation: please make your request upon your company letterhead. ● Write Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.

ADDRESS DEPT. TE-31

W&D 3947

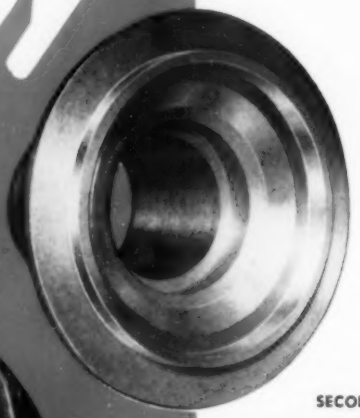
Remember this also
America must have more Scrap to make more Steel!
Get in the Scrap Now!

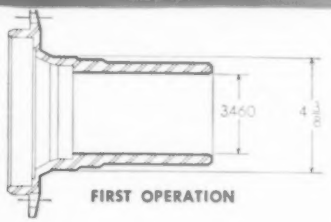
You can make it **BETTER** with
Allegheny Metal

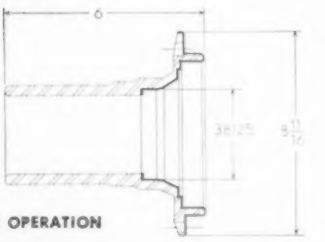
AL
TIME-TESTED STAINLESS STEEL

WHEN MACHINING OPERATIONS REQUIRE

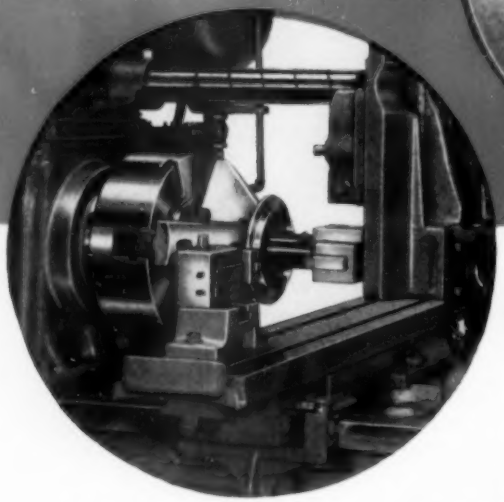
HEAVY METAL REMOVAL...







Surfaces machined are indicated by heavy lines.



THE

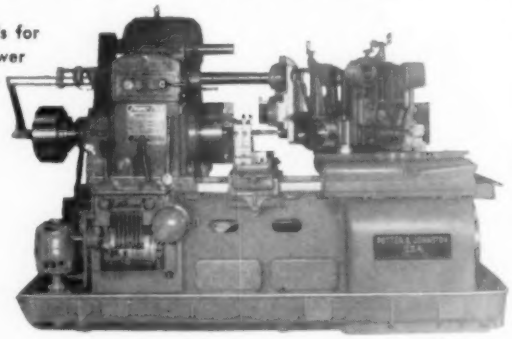
POTTER & JOHNSTON

5D Power-Flex

AUTOMATIC TURRET LATHE

Does the job with SPEED • ECONOMY • PRECISION

Profitable, high-speed production of parts like the *steel flange* shown above calls for a Potter & Johnston Automatic Turret Lathe. The 5D Power-Flex combines real power for rugged work with the versatility needed to machine intricate shapes. Fine finishes to close tolerances are consistently produced. P & J machines — plus Tooling engineered by experienced P & J specialists — mean the highest possible efficiency with more and better work and fewer rejects. Fully automatic operation means divided labor costs because one man can operate two, three — or more — machines simultaneously based on the cycle time of machining the piece.



IF you're interested in the high-speed, economical production of precision parts, you will want to send TODAY for P & J bulletin #148. And remember — you can submit your tough production problems to P & J engineers. They will recommend tooling and a sequence of operations for the highest efficiency, productivity and economy — at no obligation to you.

POTTER & JOHNSTON COMPANY

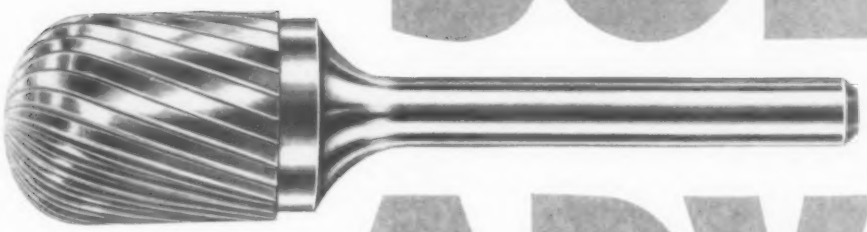
PAWTUCKET, RHODE ISLAND

Precision Production Tooling for over 50 years

SUBSIDIARY OF PRATT & WHITNEY — DIVISION NILES - BEMENT - POND CO.

WRITE DIRECT OR CONTACT THE PRATT & WHITNEY BRANCH OFFICE NEAREST YOU
BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER • SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., WEST HARTFORD
AGENTS: DALLAS, THE STANCO CO. • HOUSTON, WESSENDORFF, NELMS & CO.

SOLID ADVICE



Order ATRAX Tungsten Carbide Tools Ground-from-the-Solid

We can prove to you that it pays off to specify ATRAX precision tools ground-from-the-solid. It pays off in longer service, less production difficulties —and that means better profits for you. Send for our complete catalog, or let our engineers consult with you about your needs.

BURS, REAMERS, END MILLS, BORING BITS and OTHERS.

Send for complete catalog NOW!

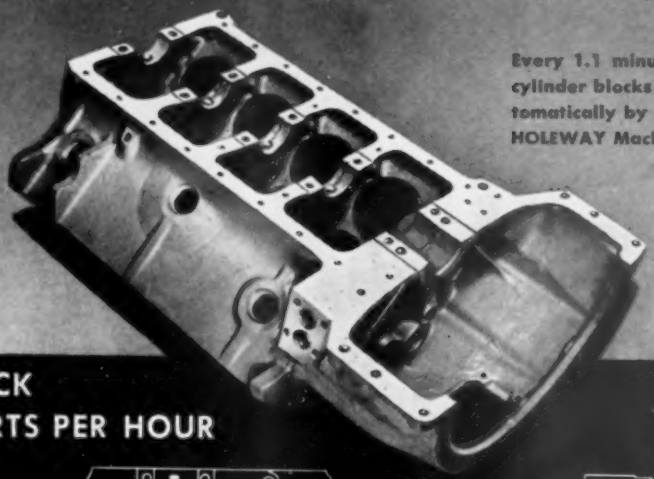
THE ATRAX COMPANY

NEWINGTON 11, CONNECTICUT

all 98 Operations

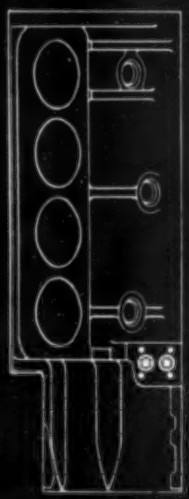
AND AUTOMATIC INSPECTION TOO!

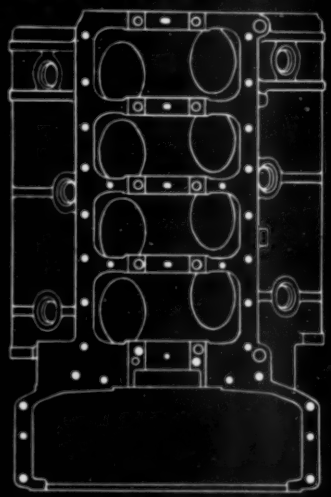
including milling, trepaning, drilling, counterboring, reaming, chamfering, automatic turning of part 360° with vibrations to remove all chips, and automatic inspection.



Every 1.1 minutes one of these cylinder blocks is completed automatically by the giant NATCO HOLEWAY Machine.

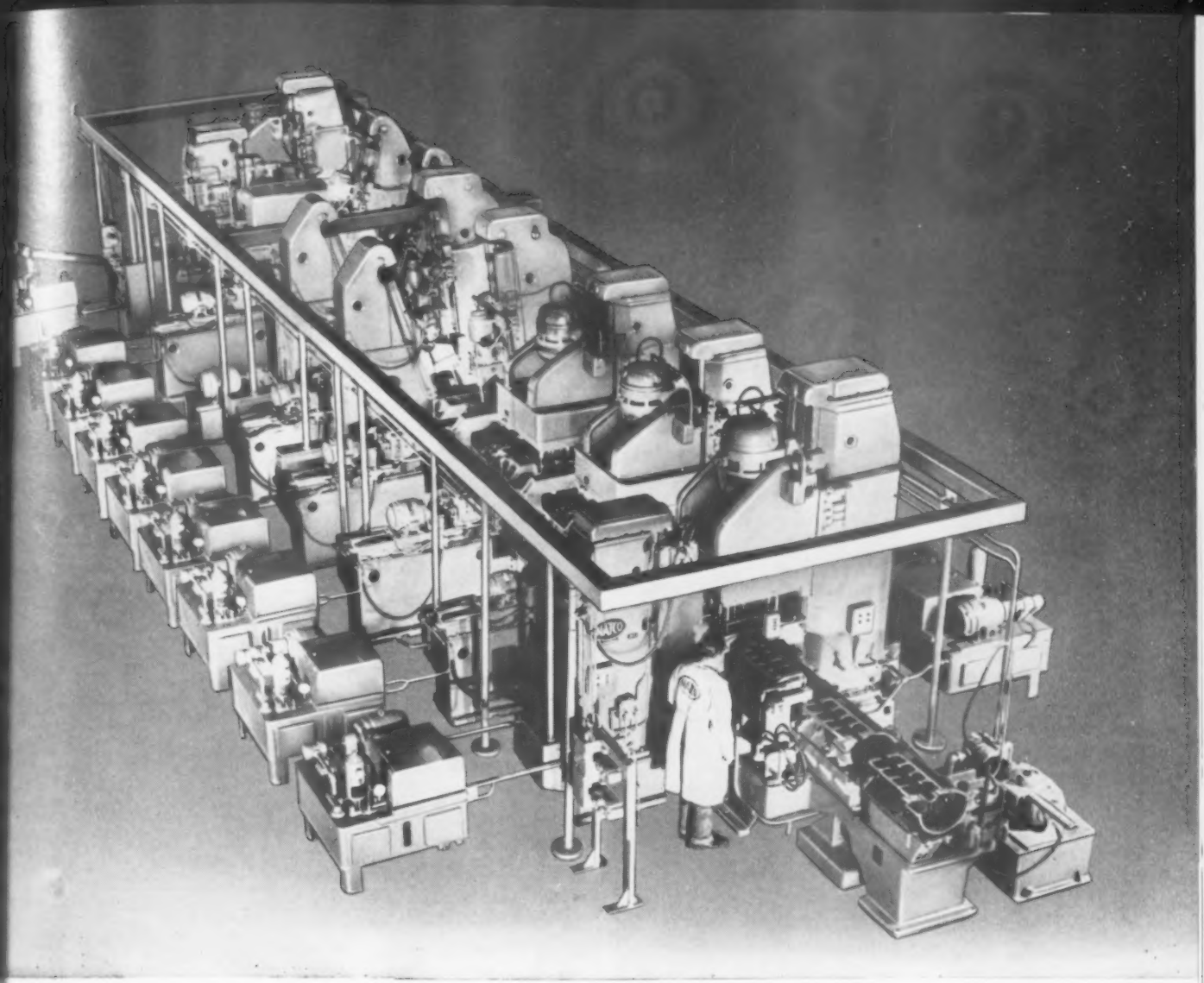
PART—CYLINDER BLOCK
PRODUCTION—50 PARTS PER HOUR





OPERATIONS

STATION # 1 Load 1 part, pan face up
STATION # 2
  Left Vertical Head
    Mill filter pad
  Right Vertical Head
    Drill 16 holes to .257" dia.
    Drill 2 holes to .368" dia.
    Drill 1 hole to ½" dia. 3" deep.
    Drill 4 holes to 15/32" dia.
    Counterbore 1 hole to 17/32" dia.
    Drill 4 holes to ¼" dia. half depth.
STATION # 3 Idle
STATION # 4
  Right Vertical Head
    Drill 6 holes to .257" dia.
    Drill 2 holes to 11/32" dia.
    Drill 4 holes to ¼" dia. to depth.
  Left Horizontal Head
    Trepan 2 holes
STATION # 5 Idle
STATION # 6
  Left Horizontal Head
    Drill 2 holes to 5/16" dia.
    Drill 1 hole to ½" dia.—3" deep.
  Right Vertical Head
    Chamfer 24 holes
    Drill 1 hole to ½" dia. to 6" depth.
    Rough ream 1 hole to .437" dia.
STATION # 7 Idle
STATION # 8
  Left Horizontal Head
    Drill 2 holes to 5/16" dia.
    Drill 1 hole to ½" dia. to 4" deep.
  Left Vertical Angular Head
    Drill 1 hole to ¼" dia. half depth.
  Right Vertical Angular Head
    Drill 1 hole to ¼" dia. half depth.
STATION # 9 Idle
STATION # 10
  Left Horizontal Head
    Drill 1 hole to ½" dia. to depth.
    Chamfer 2 holes
  Left Vertical Angular Head
    Drill 1 hole to ¼" dia. to depth.
  Right Vertical Angular Head
    Drill 1 hole to ¼" dia. to depth.
STATION # 11 Idle
STATION # 12
  Right Vertical Angular Head
    Drill 4 holes to ¼" dia. half depth.
STATION # 13 Idle
STATION # 14
  Right Vertical Angular Head
    Drill 4 holes to ¼" dia. to depth.
  Left Horizontal Head
    Drill 1 hole to ½" dia. to depth.
    Chamfer 2 holes
STATION # 15
  Turn 360° and vibrate to dump chips.
STATION # 16
  Automatically inspect oil filter pad for broken drills and hole depth. Automatically inspect vertical holes for depth.
STATION # 17
  Left Horizontal Head
    Burr the trepan on 2 holes
  Right Vertical Head
    Ream 1 hole to .5626"/.5623" and .5726"/.5723" diameters
    Ream 2 holes to .3677"/.3674" dia.
STATION # 18 Unload 1 part.



This single **NATCO** HOLEWAY Automatic Processing Machine completes **ALL 98** pan face operations on this engine block automatically **PLUS** automatic inspection at the rate of 50 parts per hour...nearly one part a minute!

Call a Natco Field Engineer

To help you solve your problems in
Drilling, Tapping, Boring & Facing.

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

1809 Engineering Bldg., CHICAGO • 409 New Center Bldg., DETROIT
1807 Elmwood Ave., BUFFALO • 2902 Commerce Bldg., NEW YORK CITY

Mark Twain!

Mississippi Pilots Use Marking Devices

Samuel Clemens adopted his pen name from the expression used by Mississippi River Pilots, such as he, indicating the 2 Fathom Marking Device affixed to their lead lines.

CADILLAC MARKING DEVICES

are Designed for ALL MARKING PURPOSES

Whatever your requirements, from small Hand Stamps to Pneumatic, Hydraulic or especially created Marking Machinery, CADILLAC STAMP COMPANY stands ready to supply or design and build to meet your needs.

CADILLAC 45 HYDRAULIC MARKING MACHINES

Compact, self-contained, manifold mounted. One control gives full range of marking depth. It will mark round, flat and irregular surfaces. Machine capacity is up to 110 one inch impressions per minute.

SOLID ROLL DIE
Assuring the utmost in accuracy—used in marking machines, lathes and screw machines.

PUNCH PRESS DIE
Faithfully reproduces and is particularly adapted to large production marking.

ROLL TYPE HOLDER
Depending on requirements, can be had for either solid or interchangeable type.

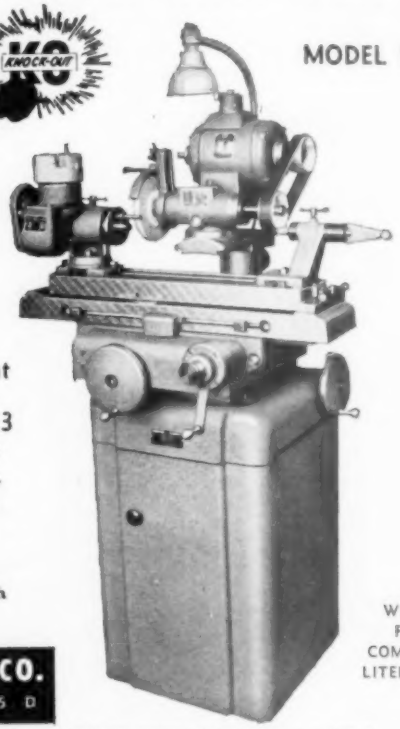
CADILLAC STAMP CO.
17313 RYAN ROAD • DETROIT 12, MICH.
3000 IRVING PARK • CHICAGO 18, ILLINOIS

USE READER SERVICE CARD; INDICATE A-7-130-1

There's a reason 71%

of all popularly-priced Tool and Cutter Grinders sold in 1951 were "Knock-Outs"

MODEL B860



Will do anything that machines costing 2 or 3 times more will do . . . yes and in less time.

Distributed Only Through Franchise Dealers

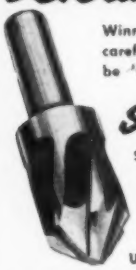
K. O. LEE CO.
ABERDEEN, S. D.

WRITE FOR COMPLETE LITERATURE

USE READER SERVICE CARD; INDICATE A-7-130-2

Severance CHATTERLESS TOOLS

HIGH SPEED CARBIDE



Winning their way on job after job, they are carefully designed to preclude chatter and can be depended on to produce superior finishes.

• • • • •

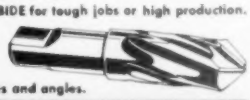
Severance CHATTERLESS COUNTERSINKS

STANDARD TYPE — Stocked in 13 diameters up to 2" and in 30°, 41°, 45°, and 60° angles (with C/L).

Sizes 1" and larger stocked also threaded for shanks — tapered or straight — in various sizes.

Use CARBIDE for tough jobs or high production.

HEAVY DUTY TYPE — Features larger shanks having a tang drive. Full range of sizes and angles.



HEADQUARTERS FOR COUNTERSINKS, REAMERS, SEATING TOOLS, and SPOTFACERS that preclude chatter.

Severance CHATTERLESS BALL SEAT REAMERS

Standard and Heavy Duty Types 8 sizes each. Made also for shaped cavities — as ordered.

BALL NOSE DRILLS — in corresponding sizes hog out the stock for Ball Seat Reamers.

Severance TAPER REAMERS

- Faster cutting
- Better finishing
- Shear-cut teeth

Tapers up to 15° quickly supplied from stock — up to 1¼" diameter x 2¾" long.

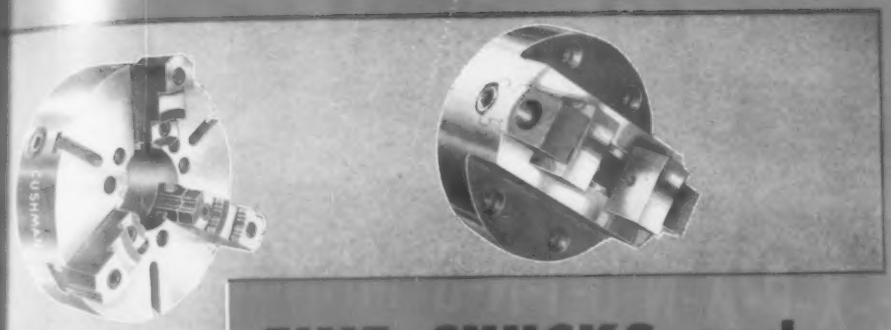
Unexcelled for holes having keyways, ports, splines, cross holes, etc.

Write for Catalog

SEVERANCE TOOL INDUSTRIES, INC.
728 Iowa Ave. Saginaw, Michigan

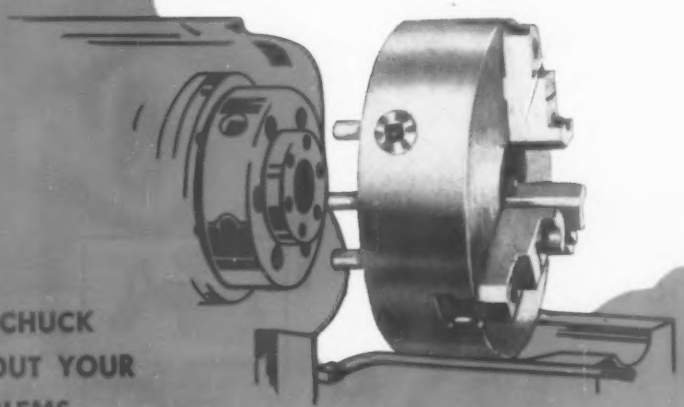
USE READER SERVICE CARD; INDICATE A-7-130-3

CONSERVE YOUR MAN-POWER

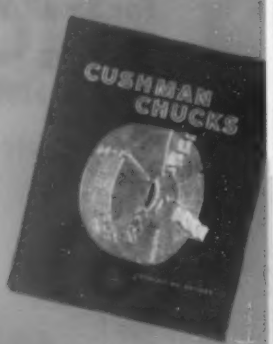


FINE CHUCKS and
GOOD CHUCK MAINTENANCE
SAVE TIME
WHERE TIME SAVING
MEANS MOST...

. . . . . at the machine!



Send for Catalog No. 64-1952 which contains engineering drawings and dimension data.



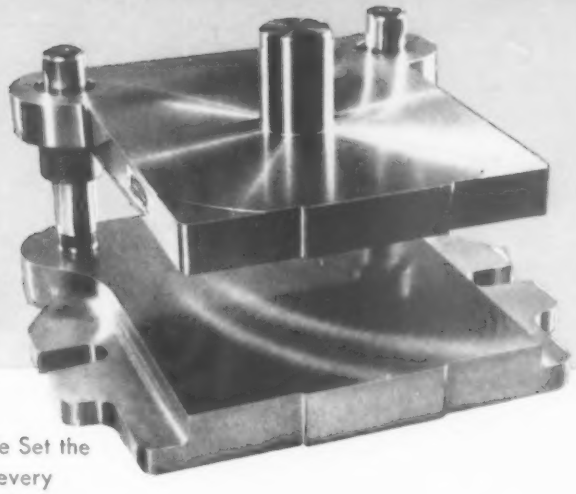
ANTICIPATE YOUR *NEW* CHUCK NEEDS. CONSULT US ABOUT YOUR SPECIAL CHUCKING PROBLEMS.

CUSHMAN CHUCKS

Cushman also manufactures Power Operated Chucks and Electric Power Wrenches.

THE CUSHMAN CHUCK COMPANY . . . HARTFORD 2, CONN.

DANLY DIE SETS PLUS



Reliable Danly precision makes every Danly Die Set the finest base for exacting die work—and in almost every case there's a *standard* set to meet your need!

DANLY DIEMAKERS' SUPPLIES PLUS

This complete line features nearly all the parts diemakers need, made to diemakers' standards. Clamps, auto-gages, swivel adapters, punch shanks and many other items in addition to those shown here are also included.

A NATIONWIDE BRANCH PLANT SYSTEM

*CHICAGO 50, 2100 South Laramie Avenue
*CLEVELAND 14, 1550 East 33rd Street
*DAYTON 7, 3196 Delphos Avenue
*DETROIT 16, 1549 Temple Avenue
*GRAND RAPIDS, 113 Michigan Street N.W.
INDIANAPOLIS 4, 5 West 10th Street
*LONG ISLAND CITY 1, 47-28 37th Street
*LOS ANGELES 54, Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2, 111 East Wisconsin Avenue
*PHILADELPHIA 40, 511 W. Courtland St.
*ROCHESTER 4, 16 Commercial St.

Indicates complete stock

EQUALS FAST, COMPLETE SERVICE

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

DANLY®

DIE SETS AND DIEMAKERS' SUPPLIES

To Obtain Further Information About Advertisers, Trade Literature or Tools of Today Appearing in this Issue of The Tool Engineer, Use the Handy Readers Service Card on Page 101.

Vanadium-Alloys

says to today's tool steel users:

Buy by Brand*

—and get the *plus* in distinctive tool steel performance *built-in* by our exclusive methods of manufacture

The performance story of a specific tool steel is not revealed wholly by chemical analysis—it is a blending of machinability, toughness, strength, ability to resist wear, and other properties affecting die and tool life. Vanadium-Alloys' complete specialization in tool steel production, exclusive manufacturing methods, and everlasting "concentration upon perfection" make each brand name significant of *more than the formula—more for you*, by every performance yardstick. Buy by brand, buy Vanadium-Alloys, and be served best on every tool steel application!

Vanadium-Alloys Die Steels for *Hot work*

- Hotform—The original 5% Chromium Hot Work Die Steel. Select this grade for superior strength and toughness with high resistance to heat checking. Outstanding on aluminum die casting dies, shear blades, forging dies, mandrels, and tools for extrusion of brass and aluminum.
- Choice—High Carbon-Chromium Type Hot Work Die Steel with good wear resisting qualities. Recommended for gripper dies, upsetting dies, and hot headers.
- Marvel—10% Tungsten Hot Work Die Steel for tools requiring better resistance to high temperatures. Excellent for punches, nut piercers and dies, and brass forging dies.
- Hotpress—Tungsten Die Steel with additional toughness for high temperature work. Outstanding on dummy blocks for brass extrusion, upsetting dies, extrusion dies, and press dies.
- Forge Die—14% Tungsten Hot Work Steel, having high resistance to softening at elevated temperatures. Recommended for piercers, punches, and hot forming dies.
- SC Special—14% Tungsten Die Steel with increased carbon for better wearing properties. Particularly adapted for extrusion punches, piercers, and forming dies.
- WW Hotwork—High Alloy Steel developed for maximum wear resistance at elevated temperatures. Used for copper and brass extruding dies, brass die casting dies, piercers for copper tubing, and nozzles on zinc die casting machines.
- Red Cut Superior J Temper—Tungsten High Speed Die Steel for high temperature service, having excellent hot hardness properties and wear resistance. Outstanding on extrusion dies, hot press dies, trimming dies, and punches.

Vanadium-Alloys
STEEL COMPANY
LATROBE, PA.
COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL COMPANY

for blending welds the *Better* way

better because - They are More Durable

DuraCut's life expectancy is 10 to 25 times that of ordinary coated abrasive discs, meaning less down-time for disc-changing — more productive time on-the-job.

better because - They are Faster Cutting

DuraCut's unique waffle pattern with multiple layers of abrasive grain allows sharp, instantaneous cutting throughout the life of the wheel. Whether it's light snagging, smoothing or blending, there's a wide range of specifications to assure obtaining a fast-cutting, long-lived wheel for your job.

better because - They are Built Stronger

Every component part, from bond to backing, is designed and treated so as to lend added strength and flexibility to the finished product.

TYPICAL APPLICATIONS:

Finishing light welds on sheet metal jobs. Automotive, truck, railroad car or locomotive and aircraft body work. Blending welds on sinks, refrigerators, stoves, metal cabinets. Rust and scale removal.

ask for a demonstration on your work

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Massachusetts, U.S.A.

Branch Offices and Warehouses —
Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All Principal Cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

BAY STATE ®

UNBRAKO CAP SCREW HEAD AND THREADS ARE STRONG

Controlled fillet and unbroken flow lines, following the contour of head and threads, eliminate the straight planes of weakness along which shear can occur. Consistently high tensile and fatigue strength, non-slip internal wrenching and fast, easy assembly with the knurled head are other UNBRAKO features that save time and money. Write us for your copy of UNBRAKO *Standards.* STANDARD PRESSED STEEL CO., Jenkintown 37, Pennsylvania.

Standard sizes, #4 to 1", are available from distributors' stocks.

SPS JENKINTOWN, PENNSYLVANIA

UNBRAKO SOCKET SCREW DIVISION CAP SCREWS • SET SCREWS • SHOULDER SCREWS • DOWEL PINS • PRESSURE PLUGS

Simple, compact design combines light weight with strength, to function dependably and accurately at high indexing speeds, with long runs between grinds.

All important bearing surfaces are hardened and ground and hand lapped.

All external surfaces are chrome plated for protection.

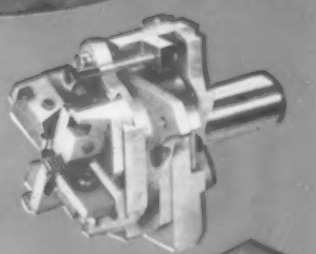
JONES & LAMSON
AUTOMATIC OPENING
DIE HEADS

for Brown & Sharpe Automatics and Small Turret Lathe Applications

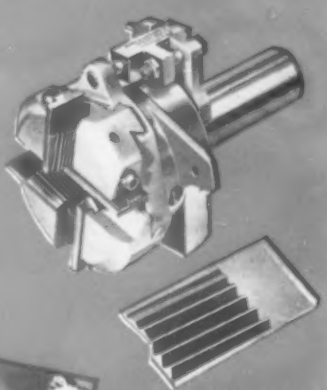
Designed and built for high production quality threading, these new J&L dies perform with smooth, easy action, unusual repetitive accuracy, and year 'round dependability at low cost. They will give you maximum productive machine hours each day.

No. 16-S is for use on No. 00 and 00G and No. 0 and 0G Brown & Sharpe Automatics and small turret lathes. It uses long wearing ground thread, radial type chasers *with two cutting edges*. These DUALIFE chasers are easily and quickly removed and replaced in their holders. When one edge wears out, just turn them over, and you have the equivalent of a new set of chasers. Minimum down time and maximum production result.

No. 18-S and 19-S Model 18-S is for use on No. 0, 0G and No. 2, 2G Brown & Sharpe Automatics. Model No. 19-S with wider capacity range, is for use on No. 2, 2G Brown & Sharpe machines. Both are also used on small turret lathes. They have Tangent type chasers, ground all over, incorporating the exact helix angle and thread form. They are easily removed and replaced without disturbing the head and holder assembly. Many of these chasers are interchangeable between the two models and other standard J & L Tangent Die Heads. Carbide chasers can be used when conditions permit.



Model 16-S Dualife Chasers



Models 18-S and 19-S with precision ground tangent type chasers

WRITE DEPT. 710 FOR TANGENT AND RADIAL DIE CATALOGS

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

J&L® DIE HEAD DIVISION

THREE CUTS IN ONE

MANHATTAN CUT-OFF WHEELS

CUT down COSTS, because the number of cuts per wheel have been increased through the development of tougher rubber and resinoid bonds. Replacement wheels are not required as frequently.

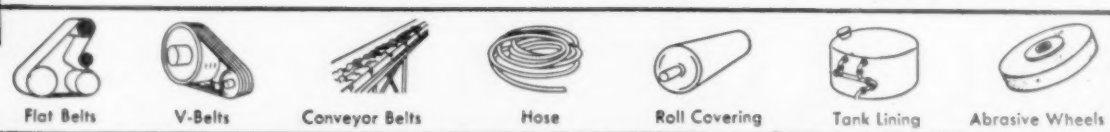
CUT non-productive HOURS, since there is less down-time for wheel changes. Manhattan Cut-Off Wheels designed for specific work and specific materials give better cuts.

CUT out PROBLEMS. Manhattan supplies you with the right cut-off wheel for ferrous or non-ferrous castings, steel bars, pipe, structural shapes, stone or reinforced concrete, light gauge tubing, hardened or soft steel, heat-sensitive alloys, ceramics, or glass.

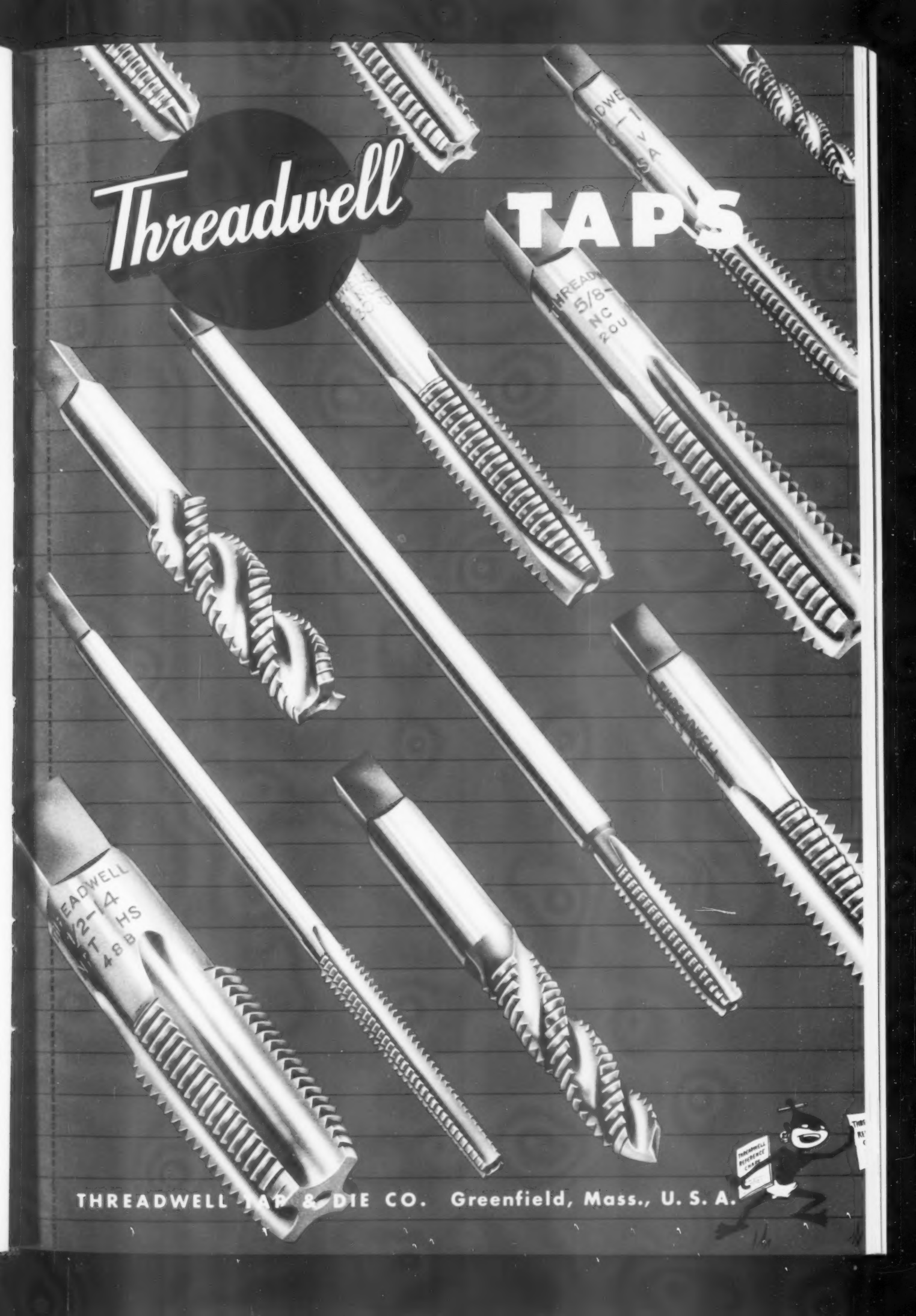
WRITE TO THE ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Packings • Brake Linings • Brake Blocks Clutch Facings • Asbestos Textiles • Sintered Metal Parts • Bowling Balls


Threadwell
TAPS
THREADWELL
1/2-14
NC
HS
THREADWELL REFERENCE CHART
THREADWELL TAP & DIE CO. Greenfield, Mass., U. S. A.

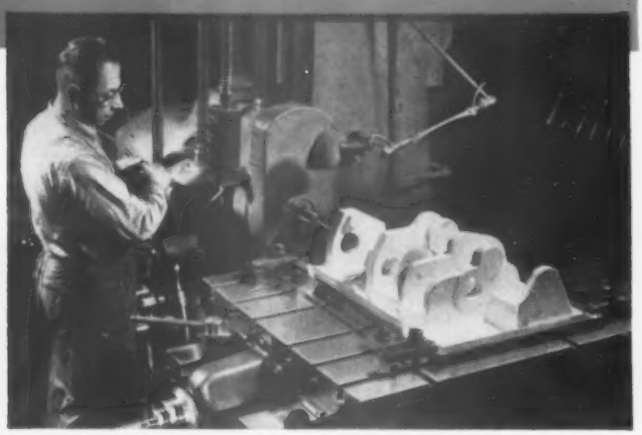
OFFSET for GRINDING TAP FLUTES

SIZE OF TAP	ANGLE OF RAKE OR HOOK														
	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	12°	14°	16°	18°	20°
	OFFSET FROM CENTERLINE OF TAP														
#6	.001	.002	.004	.005	.006	.007	.009	.010	.011	.012	.015	.018	.020	.023	.026
#8	.001	.003	.004	.006	.007	.009	.010	.012	.013	.015	.018	.021	.024	.027	.030
#10	.002	.003	.005	.007	.008	.010	.012	.014	.015	.017	.020	.024	.028	.031	.035
#12	.002	.004	.006	.008	.010	.012	.014	.015	.017	.020	.023	.028	.032	.036	.040
1/4	.002	.004	.007	.009	.011	.013	.016	.018	.020	.022	.027	.032	.037	.041	.046
5/16	.003	.006	.008	.011	.014	.017	.020	.022	.025	.028	.034	.040	.046	.052	.058
3/8	.003	.007	.010	.013	.017	.020	.023	.027	.030	.033	.040	.047	.055	.062	.069
7/16	.004	.008	.012	.016	.019	.023	.027	.031	.035	.039	.047	.055	.064	.070	.081
1/2	.004	.009	.013	.018	.022	.027	.031	.035	.040	.045	.054	.063	.073	.082	.092
9/16	.005	.010	.015	.020	.025	.030	.035	.040	.045	.050	.061	.071	.082	.093	.104
5/8	.006	.011	.017	.022	.028	.033	.039	.044	.050	.056	.067	.079	.091	.103	.115
3/4	.007	.013	.020	.027	.033	.040	.047	.053	.060	.067	.081	.095	.109	.123	.138
7/8	.008	.015	.023	.031	.039	.046	.054	.062	.070	.078	.094	.110	.127	.144	.161
1	.009	.018	.026	.035	.044	.053	.062	.071	.080	.089	.107	.126	.144	.164	.184
1 1/8	.010	.020	.030	.040	.050	.060	.070	.080	.090	.100	.121	.142	.163	.185	.207
1 1/4	.011	.022	.033	.044	.055	.066	.077	.089	.100	.111	.134	.157	.181	.205	.230
1 3/8	.012	.024	.036	.049	.061	.073	.085	.098	.110	.122	.147	.173	.199	.225	.252
1 1/2	.013	.026	.040	.053	.066	.080	.093	.106	.120	.133	.161	.189	.217	.246	.276
1/8 Pipe	.003	.007	.010	.013	.017	.020	.023	.027	.030	.033	.040	.047	.054	.061	.069
1/4 "	.005	.009	.014	.019	.023	.028	.033	.038	.042	.047	.057	.067	.077	.087	.097
3/8 "	.006	.012	.018	.024	.029	.035	.041	.047	.053	.059	.071	.084	.096	.109	.122
1/2 "	.007	.015	.022	.029	.037	.044	.051	.059	.066	.074	.089	.104	.120	.136	.152
3/4 "	.009	.018	.027	.037	.046	.055	.064	.074	.083	.092	.111	.130	.150	.170	.190
1 "	.011	.023	.034	.046	.057	.069	.080	.092	.103	.115	.139	.163	.188	.212	.238
1 1/4 "	.015	.029	.043	.058	.072	.087	.101	.116	.131	.146	.176	.206	.237	.269	.302
1 1/2 "	.017	.033	.050	.066	.083	.100	.116	.133	.150	.167	.202	.236	.272	.308	.345

52 YEARS OF SPECIALIZATION

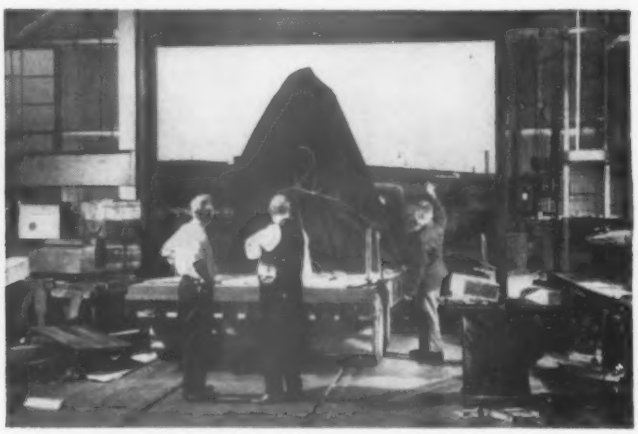
PAY DIVIDENDS IN THE DEFENSE EFFORT

Our plant is operating at peak capacity producing horizontal Boring machines, NOTHING ELSE.

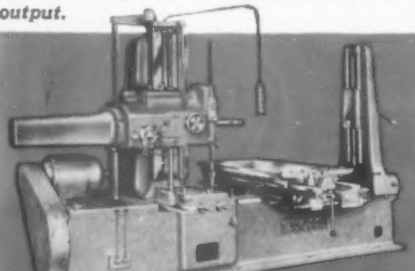


In addition, many outside suppliers are helping us around the clock (using many a Lucas purchased from us in years past).

Because of half a century of specialization Lucas men maintain high Lucas standards despite vastly increased output.



More shipments than ever, but, of course, defense priorities dictate who gets what. Perhaps this is the machine we originally scheduled for you.



THE NEW BRITAIN MACHINE COMPANY — LUCAS — CLEVELAND

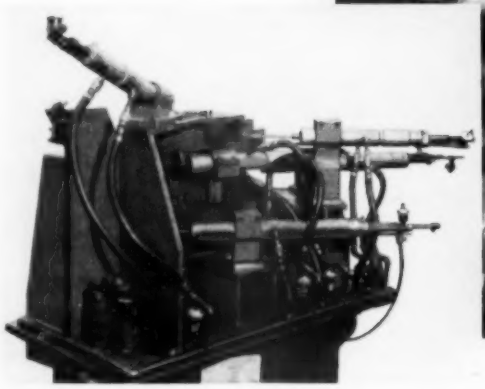
A LUCAS Precision

HORIZONTAL BORING DRILLING AND MILLING MACHINES

..is well worth waiting for

The most all-around useful machine in the shop—and your order or your inquiry are as welcome today as ever.

LUCAS MACHINE DIVISION • THE NEW BRITAIN MACHINE CO. • CLEVELAND 8, OHIO



THESE FIVE HOLES ARE DRILLED SIMULTANEOUSLY BY AIRFEEDRILLS ON THE ABOVE DRILL FIXTURE:

Diameter	Angle	Depth
¼"	25°	3 ⅛"
¼"	35°30′	3 ½"
¼"	42°	2 ½"
3/16"	compound	⅞"
3/16"	17°	1 ⅛"

Where $1,095 saved $15,000 and avoided rearranging the machine line...

The tool engineer for a farm equipment manufacturer faced the task of drilling five odd-angle holes in timing gear housings. After investigating the various means by which the job could be set up on a production line basis, he fabricated a drill fixture, costing $1,095, on which he mounted five Keller Airfeedrills as shown above. With this equipment, one workman drills all five holes simultaneously by pressing a single control valve. The drills advance, drill, retract, and stop automatically after each hole is drilled to the desired angle and depth.

If a hole angle needs to be changed, it is necessary merely to change the bracket on the drill fixture that holds the drill, and another that holds the drill bushing. Adjustment of hole depth is provided on each Airfeedrill unit. If the Airfeedrills are needed for use on another fixture, they can be detached in a matter of seconds.

Alternate equipment to handle the same job would have cost about $15,000 and required rearrangement of the machine line. The small space required for the Airfeedrill setup (15 sq ft floor area) avoided this additional expense.

Perhaps you, too, can help speed production, minimize investment, and reduce idle time of your equipment by using Keller Airfeedrills.

KELLER
Pneumatic Tools

KELLER TOOL COMPANY, GRAND HAVEN, MICH.

No wonder they keep coming to

MULTIPRESS®

Accurately gauging laminations for solenoids used in timing devices and other electrically controlled equipment is one of several unusual Multipress jobs at the National Acme Co., Cleveland, Ohio.

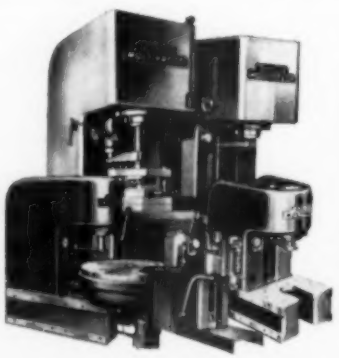
An adjustable gauge bar is attached to a solid steel block which is mounted on the ram of a 4-ton Multipress. As the gauge bar descends with the ram and contacts a stylus connected to an indicator dial, the accuracy of thickness of each stack of laminations is instantly and automatically shown — *in ten thousandths of an inch.*

Multipress is five times faster than the previous method of compressing the parts in a vise and gauging them with a hand micrometer. Rejects have been cut sharply, as all parts are evenly compressed, and checked under exactly uniform pressures.

For a difficult broaching operation on a part that had to be "handled with care," Fee and Stemwedel, of Chicago, turned to Multipress—and results were more than satisfactory.

With a single ram stroke, the 6-ton Multipress above puts 120 close-tolerance serrations around the rim of a thin-walled compass bezel made of half-hard brass. The notches are .018" deep; allowed tolerance is only .003" plus or minus. At a production rate of 800 units per hour, scrap losses average less than two per hour and these *are due entirely to incorrect placement by the operators!*

Multipress does the work with automatic accuracy. Women operators with no special training get perfect results—and they like the smooth, easy, quiet, *safe* action of Multipress.



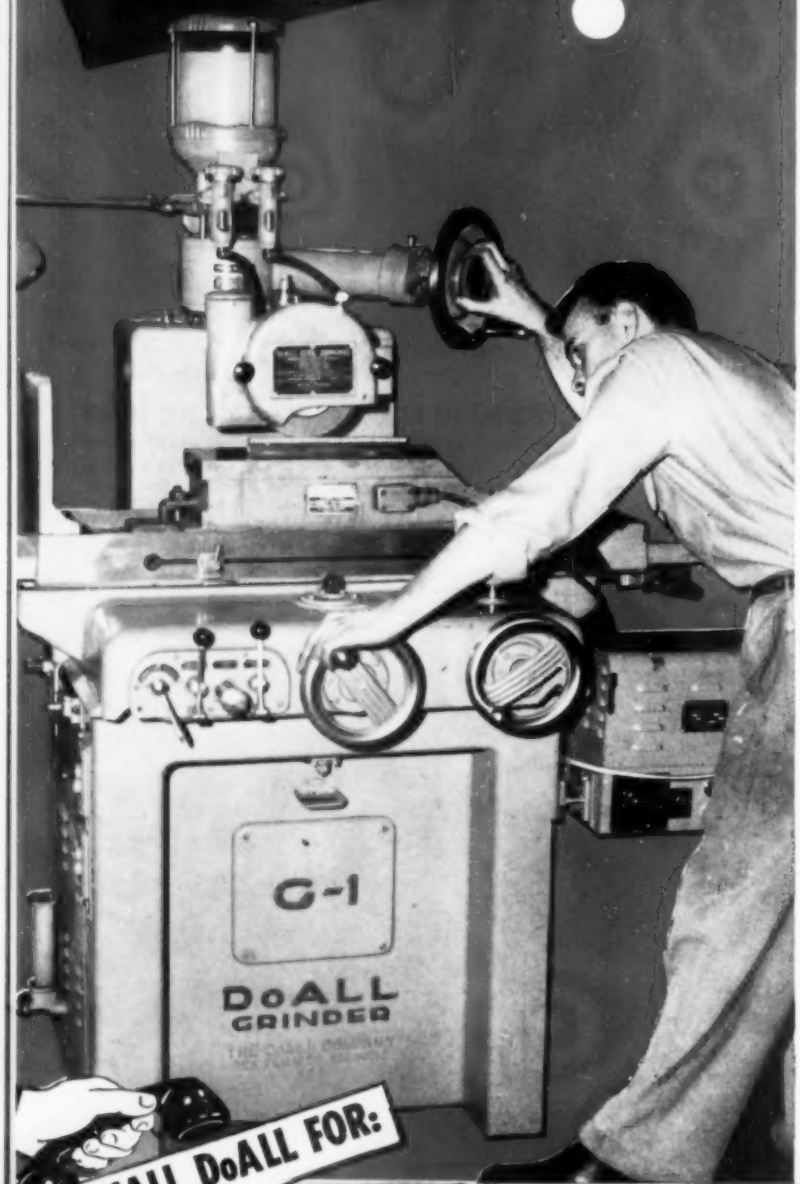
Smooth, rapid power control and accurate, widely adjustable action make Multipress the quick, cost-cutting answer to better results on hundreds of production jobs. In addition, Multipress is specially designed for easy tooling of the widest variety. Built in eight basic frame sizes, with capacities ranging from one ton to 50 tons, it offers a choice of manual and automatic controls, valving for many special types of ram action, and automatic single or sequence cycling. Hydraulically interlocked Index Table Feeds, Automatic Stock Feed and many other Multipress accessories available. Write today for full details.

THE **DENISON** ENGINEERING CO.
1191 Dublin Road, Columbus 16, Ohio

DENISON Hydr OIL ics

CAN YOUR SURFACE

Will they take the EXACT depth of cut for which you set the Down-Feed Handwheel ?



HERE'S a way to put a grinder through its paces—to find out if its got what it takes! Handwheel graduations in ten-thousandths don't mean a thing unless the wheel will obey the setting.

DoALL Precision Hydraulic Surface Grinders will take a cut that is right on the nose because they are rigid and rugged and machined to exacting perfection. The vertical column is 30 inches long to reduce misalignment to microscopic proportion. There is an automatic take-up on the spindle bearings to compensate for wear and temperature change. The frame is massive with a single-piece column support and base. The husky spindle support is dowelled and bolted to the column.

You have to see a DoALL Grinder perform to believe it—see it take .010" cuts with .010" crossfeed in high chrome, high carbon steel true to the down-feed setting in one pass.

Let your local DoALL Sales-Service store demonstrate a DoALL Grinder right in your own plant. There is no obligation.

THE DoALL COMPANY
254 N. Laurel Ave.
Des Plaines, Illinois

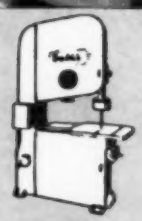
Ask For Grinder Catalog

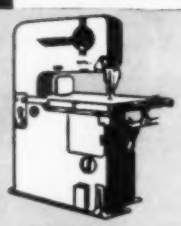
. . . complete information on the complete line of DoALL Grinders for toolroom and production work.

*Patent No. 2470350

CALL DoALL FOR:


CONTOUR-MATIC


ZEPHYR

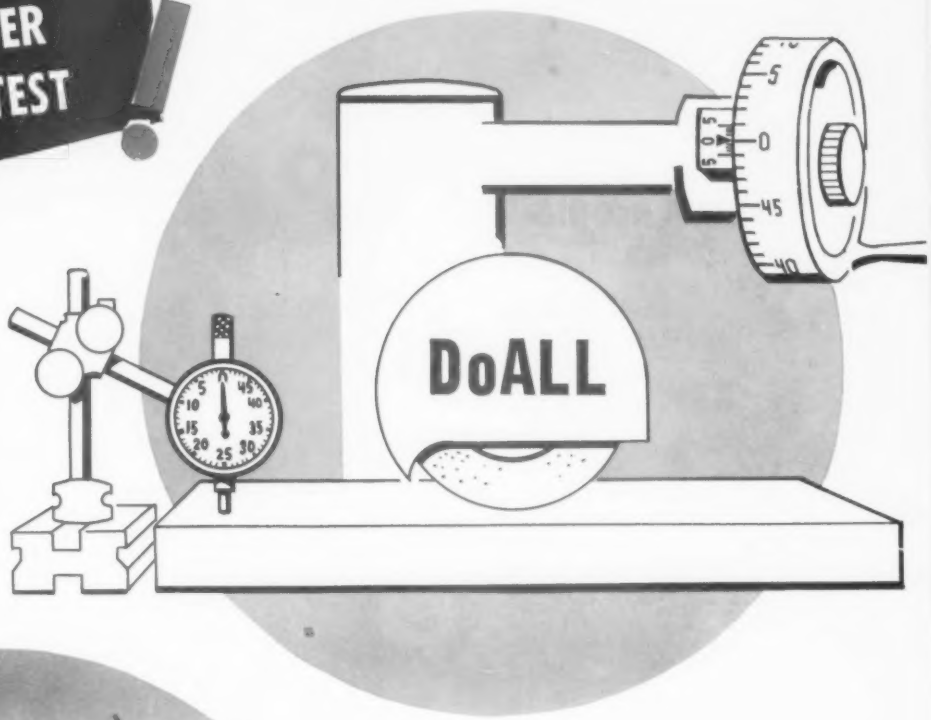

CONTOUR


BAND FILER

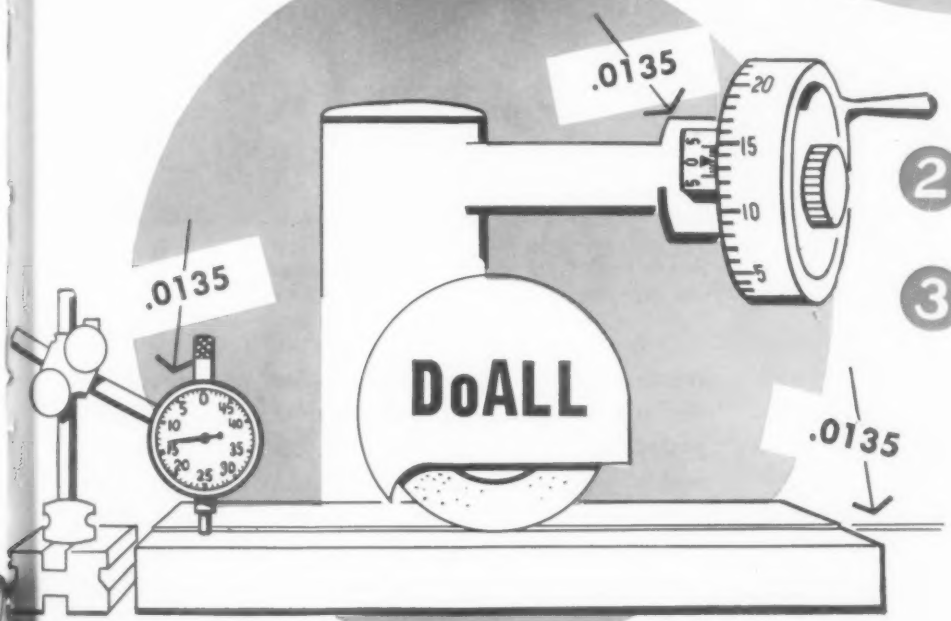

SAW BANDS

GRINDERS DO THIS?

A DoALL PRECISION SURFACE GRINDER WILL PASS THIS TEST



1 SET THE HANDWHEEL to remove .0135" of stock. Position a dial test indicator at zero reading on the work surface.



2 GRIND THE PIECE.

3 CHECK THE MATERIAL to see if exactly .0135" has been removed. If you did the job with a DoALL Grinder the dial indicator will now show the work surface exactly .0135" lower than before grinding.

ONLY DoALL OFFERS "COOL-GRINDING"
With the DoALL "Cool-Grinding" attachment on DoALL Surface Grinders, coolant flows through the wheel and out at point of contact of wheel and work in a fine mist. Temperature at point of contact is reduced as much as 400°F. Faster, heavier cuts can be taken without burning or other damage to work piece.

DoALL®

GR-7

TOOLROOM GRINDER | CRUSH GRINDER | GAGING EQUIPMENT | MONOLITE | MOBILE INSPECTION UNITS | TOOL STEEL

All Lufkin Chrome-Clad Micrometers now tapped on Warner & Swasey Tapping Machines

Warner & Swasey No. 11 Precision Tapping and Threading Machine in use at Lufkin Rule Company, Saginaw, Michigan.

THE NAME, LUFKIN, has long been associated with extreme accuracy by users of precision measuring instruments. However, many man-hours of selective assembly were required to assure such accuracy in Lufkin Micrometers—until Warner & Swasey helped simplify and speed up their production.

Now Warner & Swasey No. 11 Precision Tapping and Threading Machines tap the high precision threads necessary in the hub and in the thimble of the micrometer. They perform each of these tapping operations in one pass, where three were previously required. And Warner & Swasey's positive lead screw principle maintains an accurate and constant lead control in these threads. No longer must an operator "feel" his way into the work by hand, or risk damage to the finished threads on withdrawal.

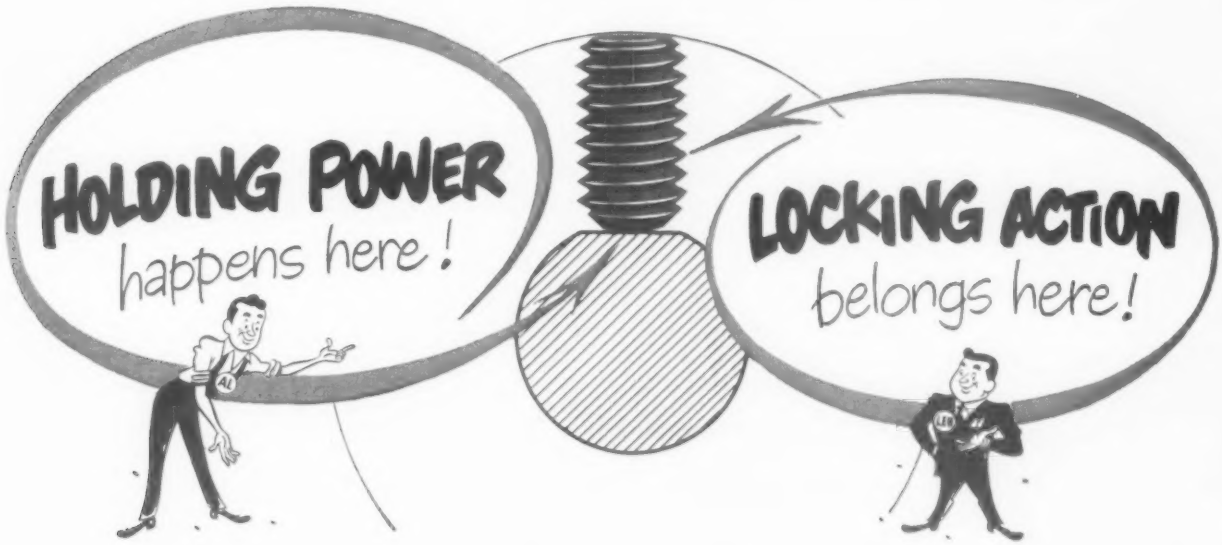
But of particular importance to Lufkin, operators can now qualify the starting positions of the taps so the "zero" mark on the micrometer's thimble matches perfectly with the reading lines on the hub when assembled. This drastically reduces the time-consuming selective and individual fitting of thimble to hub formerly necessary.

Where your work requires extreme threading accuracy on a production scale, call in your nearest Warner & Swasey Field Representative. He'll explain the many unique features of the No. 11 Precision Tapping and Threading Machine, and show you how it can improve your tapping operations.

WARNER & SWASEY
Cleveland

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

WHEN YOU SPECIFY SET SCREWS, REMEMBER . .

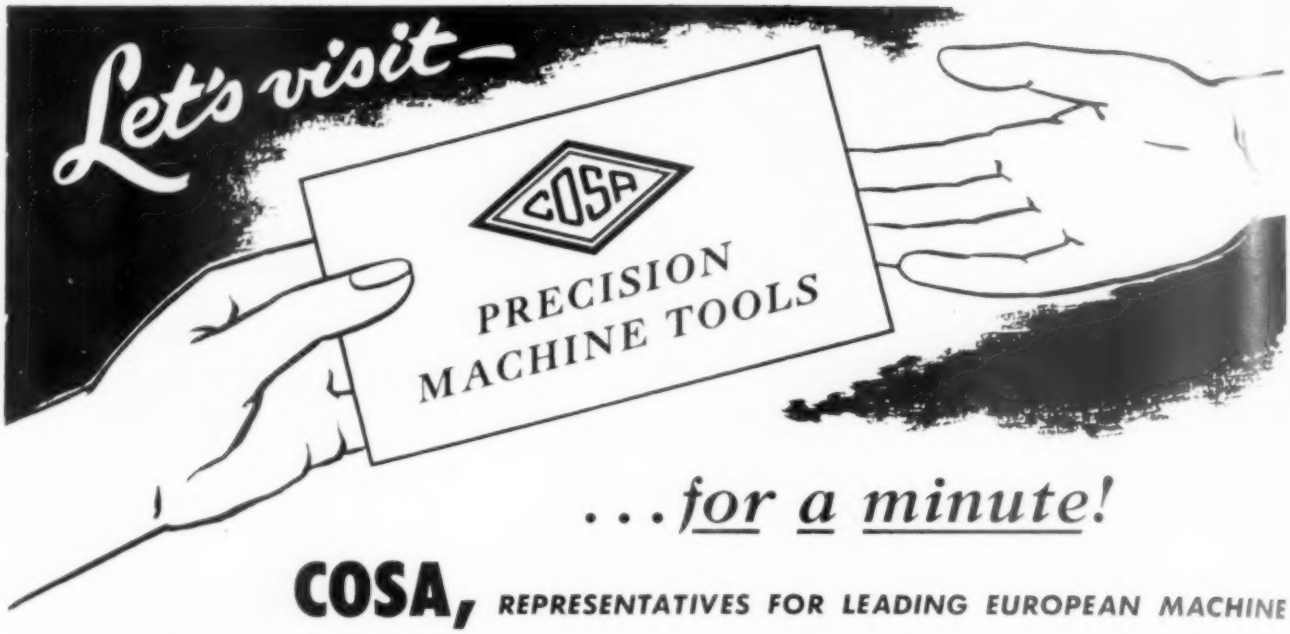


To do its job a set screw must *hold firmly* against both rotation and sideway motion, and it depends entirely on the *point* for this holding action.

Allen ○ screws hold better because they have the strength to permit firmer tightening, and because the points are designed *only* to produce maximum holding power.

Allen design does not compromise the holding power of the point in an attempt to make it perform a locking function too. Allen ○ screws require no locking action at the point, because of their high uniform accuracy of fit, pitch diameter and perfect thread lead. This provides maximum thread contact with ample friction to lock the screw in position during use and *re-use* under extreme vibrating stress.

THE **BUY** WORD IN SOCKET SCREWS IS **ALLEN**



. . . *for a minute!*

COSA, ***REPRESENTATIVES FOR LEADING EUROPEAN MACHINE TOOL BUILDERS, GIVES ALL THE SERVICES YOU WANT WHEN BUYING MACHINE TOOLS.***

DEMONSTRATION

Many machine tools can be demonstrated at our show room.

SELECTION

Engineers, thoroughly familiar with machine tools, will assist you in selecting the right equipment for the job. They can suggest the best methods for maintaining optimum production and for holding closest tolerances.

INSTALLATION

Trained specialists will, in most cases, supervise the installation and check the performance of the machines at your plant. They will also instruct your operators on the various techniques for obtaining the best machining results.

GUARANTEE

Cosa guarantees its machines to be free of defective workmanship and materials, replacing any defective parts or materials free of charge for a period of one year after delivery to you.

SERVICE

You are not forgotten after the machines are delivered. A staff of skilled service men is available to keep your equipment running at peak performance. Essential spare parts are stocked and others are obtained quickly.

EXTRA HELP

Cosa representatives abroad are in constant touch with the builders to expedite deliveries and to help solve promptly any unusual problems.

MACHINE TOOLS FOR YOUR PRODUCTION LINE OR TOOL ROOM

SWISS AUTOMATIC SCREW MACHINES • BORING, DRILLING AND MILLING MACHINES
BURNISHING MACHINES • CAM SHAPERS • COIL WINDING MACHINES
COLD SAWS • CUT-OFF MACHINES • DIE-SINKING MACHINES
DRILLING MACHINES—Bench . . Multi-Spindle . . Radial . . Sensitive . . Upright
ENGRAVING MACHINES—2 & 3 Dimensional
GRINDING MACHINES—Carbide Tool . . Centerless . . Cylindrical . . Gear . . Internal & Face . . Profile . . Surface . . Thread Worm
JIG BORERS • LAPPING MACHINES • PINION CUTTING MACHINES
LATHES—Bench . . Boring . . Copying . . Engine . . Lead Screw . . Toolroom . . Turret . . Vertical Turret
MILLING MACHINES—Copying . . Horizontal . . Profile . . Universal . . Vertical
PANTOGRAPH MACHINES • SAW SHARPENING MACHINES • THREAD CUTTING MACHINES

INSPECTION EQUIPMENT

BALANCING MACHINES
•
COMPARATORS
Mechanical—Electrical
•
VICKERS HARDNESS TESTERS
•
MULTI-DIMENSIONAL INSPECTION EQUIPMENT
•
TOOLMAKER'S MICROSCOPES

COSA CORPORATION
405 Lexington Ave., New York 17

For all-round service, contact Cosa when planning your next machine tool purchase.

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

SIDNEY LATHES

ARE JUST RIGHT FOR YOUR

LARGER TRACER

JOBS, TOO

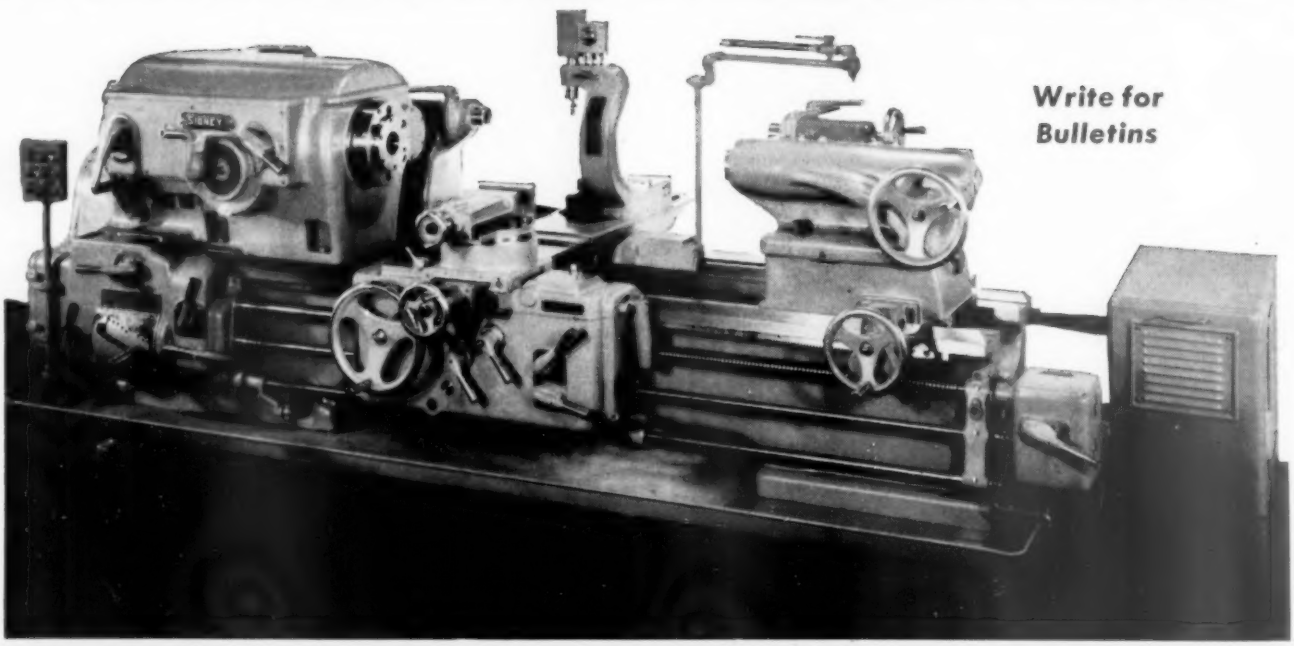
25" TRACER LATHE RAISED TO SWING 33½"

SIDNEY LATHES OFFER THE PERFECT COMBINATION OF RUGGEDNESS & SENSITIVITY

RUGGEDNESS AND BRUTE STRENGTH . . . for heaviest cuts and to withstand the most severe strains, power transmitting elements are made of unusually large proportions of finest, heat treated and hardened materials.

DELICATE SENSITIVITY . . . the Sidney FLUID TRACER permits unlimited reproduction, true to form in every detail.

SIDNEY LATHES ASSURE FAST, ECONOMICAL PRODUCTION EVEN ON TOUGHEST TYPES OF WORK



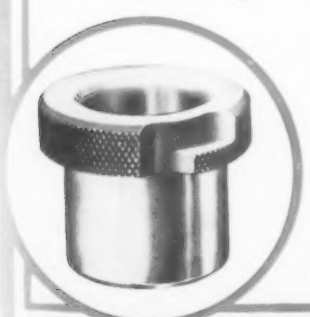
Write for Bulletins

SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO

BUILDERS OF PRECISION MACHINERY SINCE 1904

LOOK FOR
THE TRADE MARK

Want greater variety?



For a *greater variety* of Drill Jig Bushings—specify American. Our Distributors, located in every major city throughout the U. S. and Canada, carry a wide variety of sizes and types for immediate, free delivery. If you have an unusual Drill Bushing problem, our staff of competent engineers is at your service. American Drill Bushing Co. specializes only in Drill Jig Bushings, and assures you of fast service because our Distributors stock a *GREATER VARIETY.*

SPECIALIZING ONLY IN DRILL JIG BUSHINGS

Send for Catalog and name of nearest Distributor

American  **DRILL BUSHING CO.**

5107 PACIFIC BOULEVARD, LOS ANGELES 58, CALIFORNIA

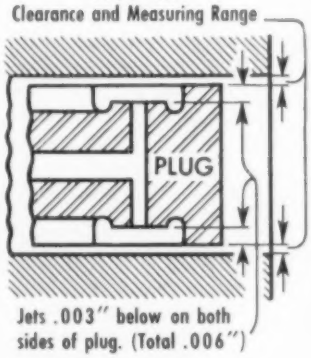
FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-7-155

You Use Only ONE MASTER with the DIMENSIONAIR!

Don't let custom mislead you . . .

The magnification is fixed . . . that is why its scale can be calibrated.

Both the Dimensionair and the master ring are constant. Only the dimension of your *workpieces* can vary. Because the Dimensionair is a precision measuring instrument with a constant scale value, only a single master is required to check the zero location. Don't let past customs mislead you. The Dimensionair is the only air gage built with enough precision to permit you to use a single master.



MORE RANGE
MORE WEAR

When the Plug Wears You're Still Safe with the Dimensionair.

FIRST. This is so because the Dimensionair's greater measuring range allows greater clearance which in turn results in less plug wear. (The Dimensionair Range is .003" on a 2500 to 1 magnification.)

SECOND. Only jet wear can change calibration. Dimensionair jets can't wear because they are deeply recessed into the plug body. (On Dimensionair Plugs each jet is .003" below the plug surface.) Hence, a plug can be worn a great deal more than usual without any fear of wearing into the face of the jets.

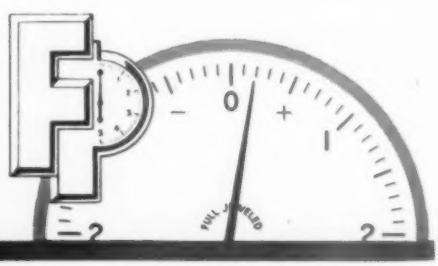
THIRD. When a plug eventually wears to the danger point you will be warned because the gage will clearly show that the readings are no longer stable when you test the plug in the master ring.

FOURTH. Because the jets are located so much deeper than has been customary, they are protected from damage and because the jet holes are larger, there is less danger of the holes becoming clogged with dirt.

A single master is common practice in using Dial Indicators and other types of precision indicating gages. The inherent precision of the Dimensionair makes it possible for you to continue this practice. Those who already own Dimensionairs find this to be true. It is worth your while to learn how satisfactory it is to use the Dimensionair. FEDERAL PRODUCTS CORPORATION, 1197 Eddy Street, Providence 1, Rhode Island.

FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing *all types* of DIMENSIONAL INDICATING GAGES



Specialists IN ONE THING, the World's BEST Bushings

Here, at ACE all our energies are concentrated on one product —the world's finest drill bushing. ACE Drill Bushings are engineered for maximum accuracy—guaranteed by triple inspection and light wave control. No wonder engineers everywhere specify ACE for exacting, ultra-precision work. Order your FREE copy of our new catalog today.

Ask for Catalog 1101-2

ACE DRILL BUSHING CO., INC

5407 Fountain Ave.
Los Angeles 29

USE READER SERVICE CARD; INDICATE A-7-157-1

RUTHMAN GUSHER COOLANT PUMPS

Dependable, is the word for Gusher Coolant Pumps. They give you instantaneous coolant flow where you want it, when you want it. There is no priming or packing needed with Gusher Pumps and pre-lubricated heavy-duty ball-bearings eliminate constant attention. You should specify Ruthman Gusher Coolant Pumps on all your metal working machinery. Write for catalog today.

THE **RUTHMAN** MACHINERY CO.

1810 READING RD., CINCINNATI, OHIO

USE READER SERVICE CARD; INDICATE A-7-157-2

MODERNIZE!

Like your safety razor- you only replace the blades in

WAUKESHA *Inserted* BLADE REAMERS

WAUKESHA *Inserted* Blade Reamers are Tops in economy. The Reamer body lasts for years; your only cost is for new blades when replacement is needed.

And **WAUKESHA** *Inserted* Blades have long lived, high precision cutting edges that give you a clean, smooth and positive sheer.

WAUKESHA *Inserted* Blade Reamers save horsepower, increase production and faithfully give you more holes per grind.

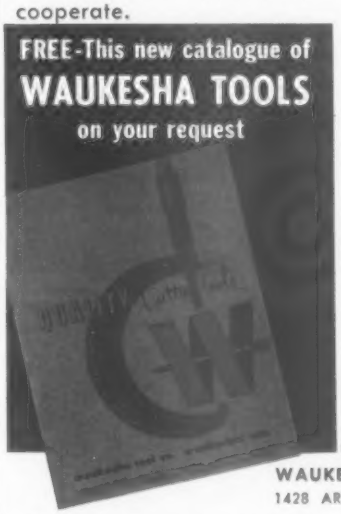
WAUKESHA *Inserted* Blade Reamers are low in their initial cost, too, so you save money right from the start.

WAUKESHA TOOL COMPANY offers Cutting Tools in heavy duty high speed steel or carbide tipped. Standard tools, ready for immediate shipment are,

- Long Shank Reamers
- Short Shank Reamers
- Shell Reamers
- Spade Drills
- Arbors

But **WAUKESHA** also has unusual facilities for the manufacture of special tools to meet your individual problems. **WAUKESHA** Engineers will welcome an opportunity to cooperate.

"in reamer work of every kind **WAUKESHA** means more holes per grind!"



Complete specifications for all models of WAUKESHA Cutting Tools are given in this new, concise catalogue. It also describes WAUKESHA's manufacturing, engineering and designing facilities. Please send for it today. Use the convenient coupon below if you prefer.

WAUKESHA TOOL CO.

1428 Arcadian Avenue
WAUKESHA, WISCONSIN

WAUKESHA TOOL CO.
1428 ARCADIAN AVE., WAUKESHA, WIS.

Please send your recent catalogue to

Name.....

Company.....

Street..... City..... State.....

USE READER SERVICE CARD; INDICATE A-7-157-3

tool steel is the apple of our eye!

We're especially proud of our tool steels . . . because users rate them tops in the field. In fact, users think so highly of them, they've made Crucible the country's number one producer of these fine steels.

We like this enviable position. Thus, we make sure our research and development keeps step with industry's need for new, improved tool steels. You, too, can profit from our long experience by taking advantage of our metallurgical service. You are assured of prompt delivery of your requirements from our fully-stocked warehouses, strategically-located throughout the country.

SEND TODAY for the unique Crucible Tool Steel Selector—a twist of the dial gives the tool steel for your application.

Rex® High Speed Steels
Peerless Hot Work Steels
Halcomb 218
Chro-Mow®
Sanderson Carbon Tool Steels
Ketos®
AirKool Die Steel
Airdi® 150
Nu-Die V Die Casting Steel
CSM 2 Mold Steel
La Belle® Silicon #2
Atha Pneu

SPECIFY YOUR TOOL STEELS BY THESE BRAND NAMES

Crucible Steel Company of America
Dept. T, Chrysler Building, New York 17, N. Y.

Name_____

Company_____ Title_____

Address_____ City_____ State_____

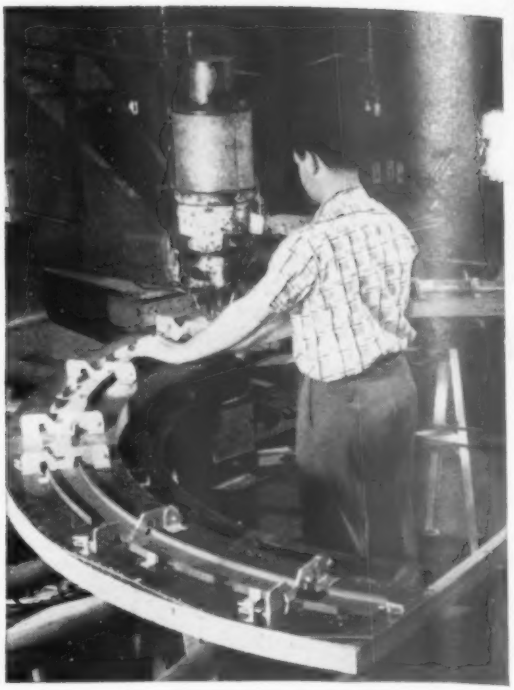
9" diameter, 3-colors

CRUCIBLE first name in special purpose steels

52 years of Fine steelmaking

TOOL STEELS

CRUCIBLE STEEL COMPANY OF AMERICA · TOOL STEEL SALES · SYRACUSE, N. Y.



Jigs and Fixtures are easier to machine – easier to handle when made of **Aluminum.** Investigate the **Substantial Savings** possible with **Alcoa** Tool and Jig Plate.*

- Moderately priced.
- Strain relieved—machined both sides.
- Tolerances on plates of thicknesses from ½" to 4" held within ± .010".
- Cut to any desired dimensions up to 48" x 96". Immediate delivery.

**For more information on Alcoa Tool and Jig Plate, contact your local Alcoa sales office... or write ALUMINUM COMPANY OF AMERICA, 1952-G Gulf Building, Pittsburgh 19, Pa.*

ALCOA

TOOL AND JIG PLATE

FOR THOSE TOUGH *Special* JOBS

...DEPEND ON

National Tool Co.

● Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

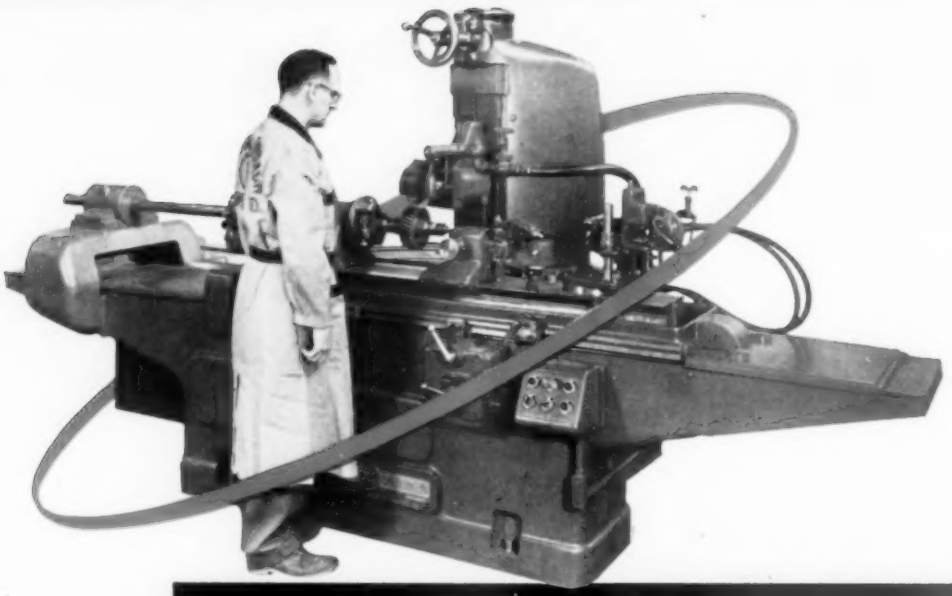
Since 1905 engineers and manufacturers of high-quality special cutting tools for the metal-working industry

National Tools Cleveland

National

TOOL CO.

Cleveland 2, Ohio



Indexing mechanism of the Helical Grinder

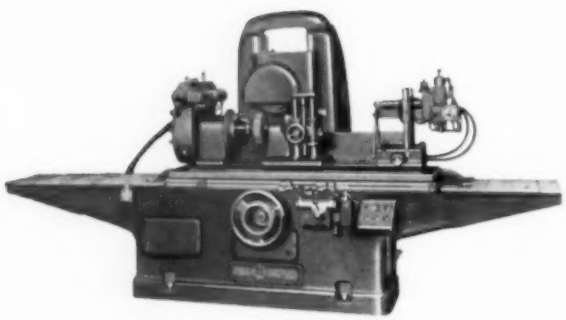
NEW HELICAL GEAR AND SPLINE GRINDER

Assures Highest Accuracy in both Lead and Tooth Form

The new Red Ring Helical Gear and Spline Grinder, Models SGF-12" and 18", incorporate the lead bar principle thus eliminating the inherent errors, human and mechanical, of conventional methods heretofore used to maintain specific lead or helix angle.

The lead of every gear tooth or spline is exactly alike—exactly the same as that of the precision ground master lead bar which rigidly controls the progressive rotation of the work part as it is traversed under the grinding wheel.

The grinding wheel is dressed to any desired tooth form. That form is controlled by a hardened steel master form plate which guides the movement of the dresser diamonds.



Red Ring Spur Gear and Spline Grinder, Models SGD-12" and SGC-18"

Write for descriptive folder on Red Ring Gear and Spline Grinders both helical and spur.

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

NEW! HANNIFIN PRECISION BUILT "Space Saver" HYDRAULIC CYLINDERS

SPECIALLY DESIGNED FOR MACHINE TOOL BUILDERS

When you mount a hydraulic cylinder in a *machine tool,* it *ought* to be good. It *should* be precision engineered . . . quality constructed for long, trouble-free service.

Now, Hannifin offers that kind of hydraulic cylinder in its two compact "Space Saver" lines. Designed by Hannifin Engineers, these cylinders make no compromise with good design—are built to the exacting standards that have made Hannifin Series N cylinders the standard of the industry.

Whether you need these rugged, all-steel hydraulic cylinders for production tools or for machines you build for resale, investigate these new Hannifin designs today!

NEW HANNIFIN TYPE SS "SPACE SAVERS"

9 Bore Sizes, 1½" to 6"—Pressures to 2000 P.S.I.

WHY HANNIFIN "SPACE SAVERS" ARE BEST FOR YOUR MACHINES

Ruggedly constructed in FULL COMPLIANCE with J.I.C. Hydraulic Standards. MULTIPLE seal gland packing removable without disassembling cylinder—UNOBSTRUCTED ports—PRECISION piloting of cylinder body and end caps—pre-stressed tie rods—positive end seals—end caps machined from solid steel—hardened rods available. As in all other Hannifin designs, cylinder walls are "Tru-Bored" and honed; rods are turned, ground and polished; mounting clevises, angles and flanges are sturdy, well designed.

WRITE FOR BULLETIN 111

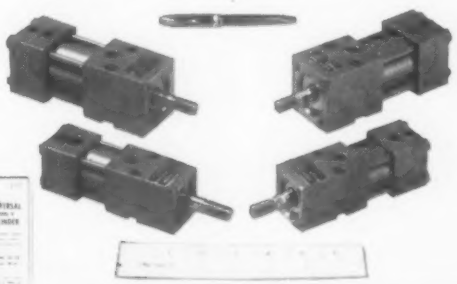
Contains complete construction details and specifications for all models.

NEW UNIVERSAL MODEL U

1", 1¼", 1½" Bores—Pressures to 1000 P.S.I.

IDEAL FOR TOOLING, JIG OR FIXTURE WORK

Compact! The 1" bore cylinder is only 1½" square. Basic cylinder mounts on side or either end—also furnished with mounting flanges or head end clevises. Gland packing and piston seals feature Hannifin's new, thoroughly tested "Lip-seal" packing, which makes it possible for these compact little cylinders to operate on either hydraulic oil or lubricated air. Combines low friction with minimum leakage. Hardened rods standard.



WRITE FOR BULLETIN 112

Complete description and specifications

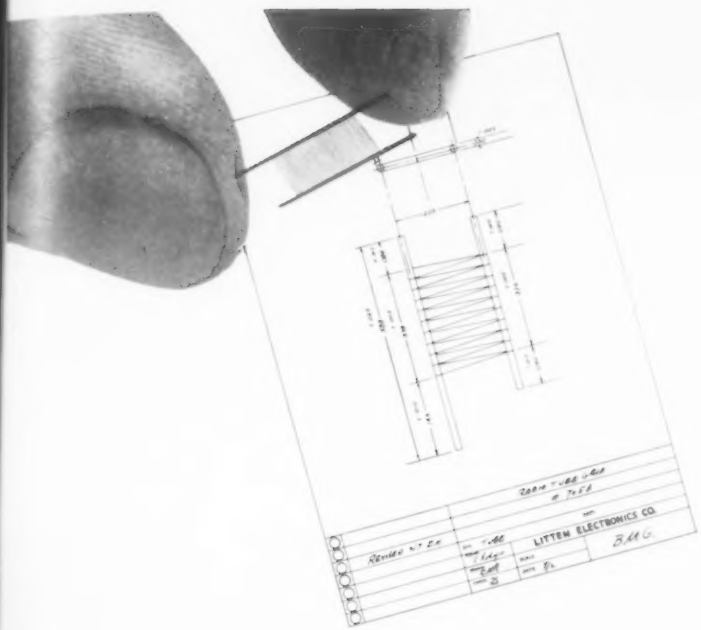
do ALL you CAN do . . . with

HANNIFIN

Hannifin Corporation, 1119 S. Kilbourn Ave., Chicago 24, Ill.

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves


THE NEW BRITAIN MACHINE COMPANY
NB
Invest in better methods for guaranteed returns
Automatic Bar and Chucking Machines • Precision Boring Machines
Lucas Horizontal Boring, Drilling and Milling Machines
New Britain +GF+ Copying Lathes
NEW BRITAIN
Automatics
THE NEW BRITAIN GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT



Tight "specs" on small, fragile parts

are quickly and completely checked on a KODAK CONTOUR PROJECTOR

Whether you're checking this tiny radio tube grid or a big, intricate commutator a foot in diameter, a Kodak Contour Projector keeps on paying its way in your inspection department.

The new Model 2A is seen here being used to measure spot samples of parts far too delicate for any but the optical method of gaging.

Newly designed vertical and horizontal measuring attachments let you apply precision micrometry to otherwise inaccessible dimensions that would be distorted by mechanical contact.

Moments later, you might want even more precise measurements on a bulky part that needs the full eight inches of clearance between lens and object plane. With the Kodak Contour Projector, you get this large working space for any of six magnifications you can dial.

If you need optical gaging for rapid routine inspection rather than for measurements, the stripped-down Model 3 is your choice. A fixture designed for maximum efficiency in handling your particular part goes on the stage. Over the screen goes a chart-gage keyed to the fixture and carrying all tolerances. Even an inexperienced operator can either pass a part or see at once which of many dimensions are off and by how much. To inspect an entirely different kind of part means only slipping in a different fixture with its corresponding chart-gage.

In your area there's an engineer with wide experience in both aspects of optical gaging technique. It will cost you nothing to discuss with him the details pertinent to your own particular requirements. To get in touch with him, write Eastman Kodak Company, Industrial Optical Sales Division, Rochester 4, N. Y.

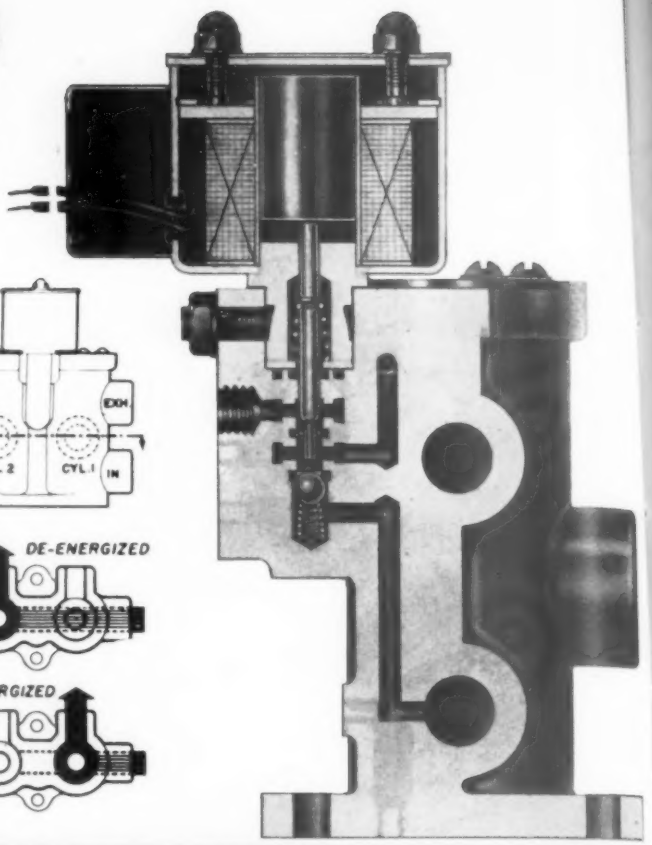
the KODAK CONTOUR PROJECTOR

Optical Gaging

A new sound movie shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

Kodak
TRADE-MARK

WHAT?



CRESCENT

SOLENOID CONTROLLED

PILOT OPERATED

4 WAY VALVES

2 POSITION

FOR AIR • WATER • LITE OIL

TO 150 PSI.

WHY?

BECAUSE THEY SAVE YOU MONEY

- **LOW CURRENT DRAIN**
- **SOLENOID CAN'T OVERLOAD**
- **NOT SENSITIVE TO DIRT**
- **LESS MAINTENANCE — LONGER LIFE**
- **FAST CONTINUOUS CYCLING**
- **POSITIVE SEAL — NO LEAKAGE**
- **VERSATILITY — PILOTS INTERCHANGEABLE**

JOBBERS!

In some areas excellent opportunities exist for representation of the Crescent line by jobbers or dealers now handling related equipment, such as cylinders, air operated devices, or resistance welding equipment.

HOW?

YOU CAN BANK ON THESE FACTS

WRITE AND HAVE OUR REPRESENTATIVE SHOW THEM TO YOU.

BARKSDALE VALVES

1566 EAST SLAUSON AVENUE • LOS ANGELES 11 • CALIFORNIA

THE right TOOL

Every mechanic knows the importance of having the right tool for the job.

In a hand operation, a good man can make up for deficiencies in his equipment by his personal skill and know-how. A machine does not have this skill. The Tool must be right. The men who design and build the tools must have the know-how.

For over thirty years the Micromatic organization has been developing, building, and servicing honing tools. Every Micromatic tool is engineered to give the greatest possible precision and productive life.

We have the right tool for your job. Buy from the organization with a complete line of honing tools for every type and size of cylindrical surface.

Write for the complete story of Microhoning Tools in "Cross Hatch."

Micromatic

MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

MICROMATIC HONE CORPORATION

8100 Schoolcraft, Detroit 4, Michigan

MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
Boston Post Road
Guilford, Connecticut

MICROMATIC HONE CORP.
614 Empire Building
26 So. Main Street
Rockford, Illinois

MICROMATIC HONE CORP.
1323 S. Santa Fe Avenue
Los Angeles 21, California

MICROMATIC HONE LTD.
55 George Street
Brantford, Ontario, Canada

MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
231 So. Pendleton Avenue
Pendleton, Indiana

REPRESENTATIVES: Overgard Machine Tool Company, 838 Symes Building, Denver 2, Colorado
Hallidie Machinery Co., 2726 First Ave., South; Seattle, Wash. . REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

AT E. C. ATKINS & CO.

A Lindberg Induction Heating Unit brazes carbide tips on circular saws

E. C. Atkins & Co., Indianapolis, Indiana, manufacturer of saws has joined the long list of companies using Lindberg Induction Heating Equipment. Atkins uses a 5 KW unit plus a specially designed fixture to braze carbide tips on large circular saws.

This unit as well as many other Lindberg units in all sections of the country are piling up good production records . . because they are ruggedly engineered and built to minimize irritating breakdowns and expensive work stoppages.

These construction features tell an important part of the story:

Conditioned cooling . . Temperature controlled water cooling eliminates condensation on high voltage parts.

Checklites . . A system of indicating lamps instantly reveals any abnormal operating conditions . . simplifies servicing.

Work coil burn-out protection . . An electrical interlock system makes it impossible to turn on power when cooling water is not flowing.

Long-life industrial tubes feature shortened internal structure . . Kovar metal-to-glass seals . . heavy walled anodes.

Sealed tank capacitors are hermetically sealed against dirt and dust . . require no servicing or refilling.

For your production brazing, soldering, hardening, annealing, stress relieving, hot forming, forging or shrink fitting requirements, investigate Lindberg Induction Heating Units. Ask for Bulletin 1440.

LINDBERG

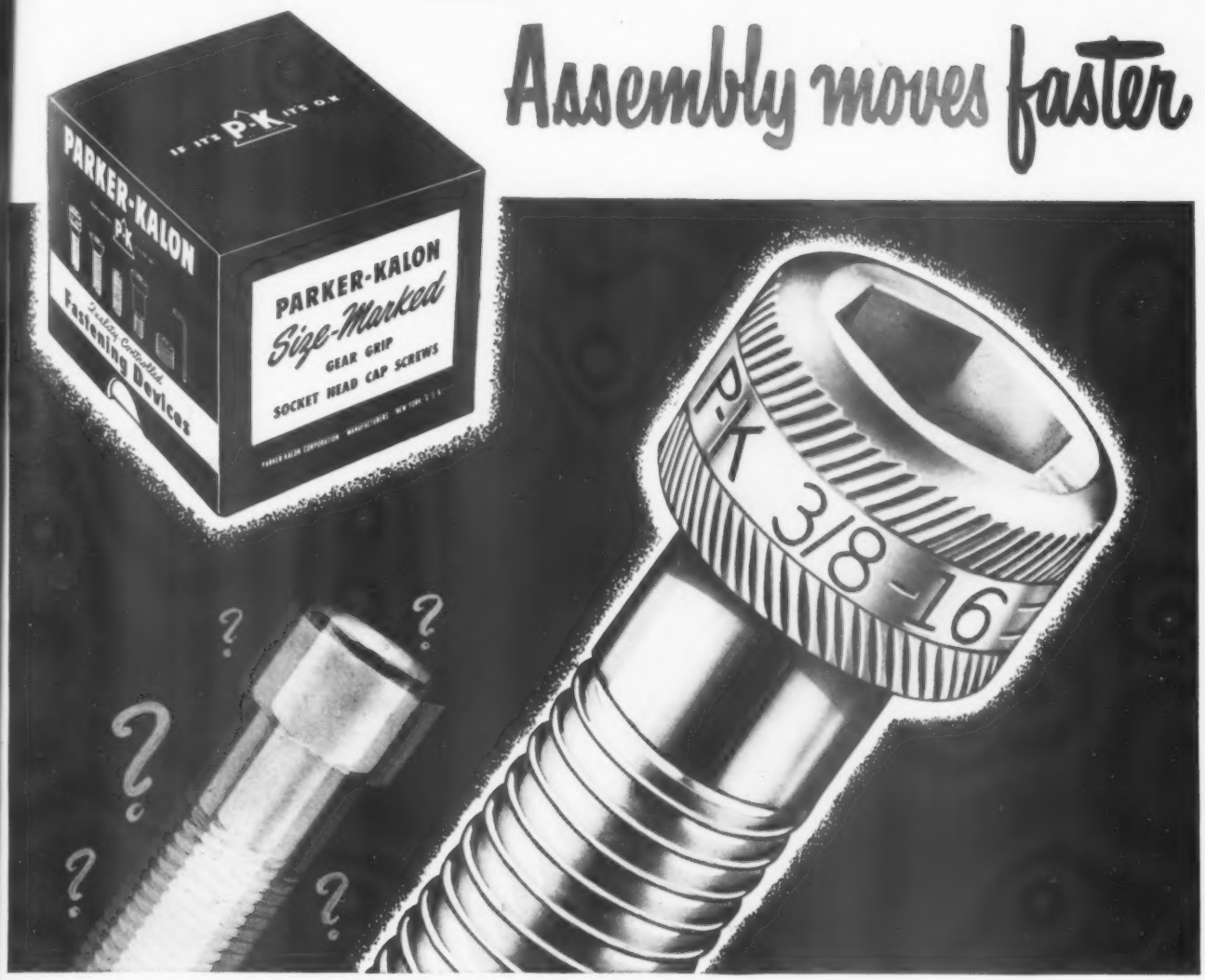
HIGH FREQUENCY DIVISION

LINDBERG ENGINEERING COMPANY,

2450 West Hubbard Street, Chicago 12, Illinois

When all eyes can read the size

Assembly moves faster



good judgment calls for PARKER-KALON® when good design calls for SOCKET SCREWS

Your **INDUSTRIAL SUPPLY DISTRIBUTOR**— *your local source for P-K Socket Screws— works side by side with the P-K Assembly Engineer. Their combined efforts are solving many difficult problems of planning and procurement. Let them help you.*

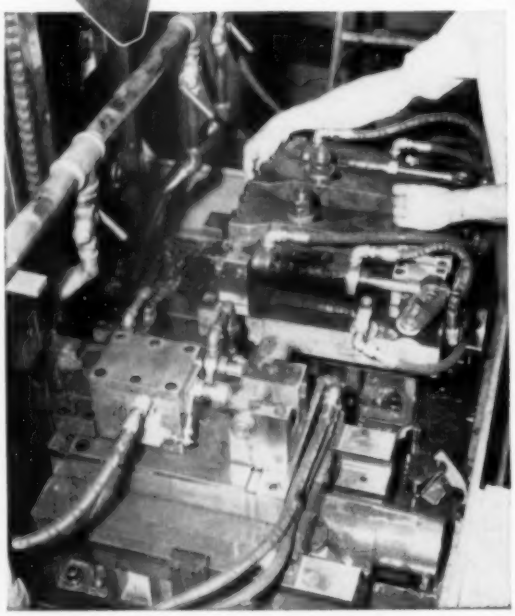
Some sharp-eyed mechanics are expert at estimating the size of a plain head cap screw. But *most* assembly workers, and especially learners, need the screw that puts size beyond question . . . *the P-K Size-Mark Socket Head Cap Screw.*

The size is clearly incised on the head, can be seen at a glance. Saves time and wasted screws when sizes get mixed up, prevents errors and spoiled work. It's a good sales feature, too, because installation and repair work on your product is simpler and easier.

Only P-K offers both Size-Mark and Gear Grip in Socket Head Cap Screws. Ask for samples. See how they save time and trouble all along the line. Parker-Kalon Corporation, 200 Varick Street, New York 14.

SIZE-MARKED CAP SCREWS • GROUND THREAD SET SCREWS • FLAT HEAD CAP SCREWS • STRIPPER BOLTS • PIPE PLUGS • HEX KEYS

2 separate broaching operations on 1 machine speeds production of tank track parts



the *American* way broached these two sides and these two radii on this tank track part, at the rate of *one part every ten seconds.* The machine used was an American SBD 48-15 Dual Ram Broaching Machine equipped with two American-engineered fixtures, featuring automatic hydraulic clamping, and mounted on two standard receding tables which operate alternately. The left hand table holds two parts for straddle broaching the sides. The right hand table holds two parts for broaching the two radii on each part. A continuous automatic cycle permits the operator to simply load and unload the parts at one fixture while the other fixture broaches.

FULL ROUND BROACHES ADD TO ECONOMY

Full round broaches are used to broach the half rounds. They are simply rotated 180° when dull thus increasing the number of parts produced between resharpenings.

This is a typical example of the complete service you get from American Broach . . . the organization that gives you the extra advantage of experience gained in producing all three . . . broaches, machines and fixtures. For the answer to your problems just send a part-print and hourly requirements. No obligation. Address Dept. T.

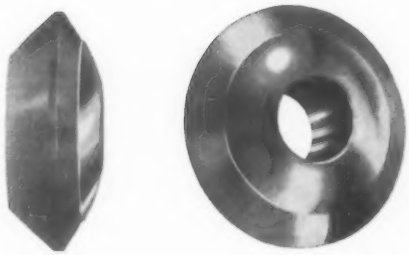
For more information on the American SBD 48-15 write for Circular #300.

AMERICAN *American* BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

ACHINING FACILITY IS TANGIBLE

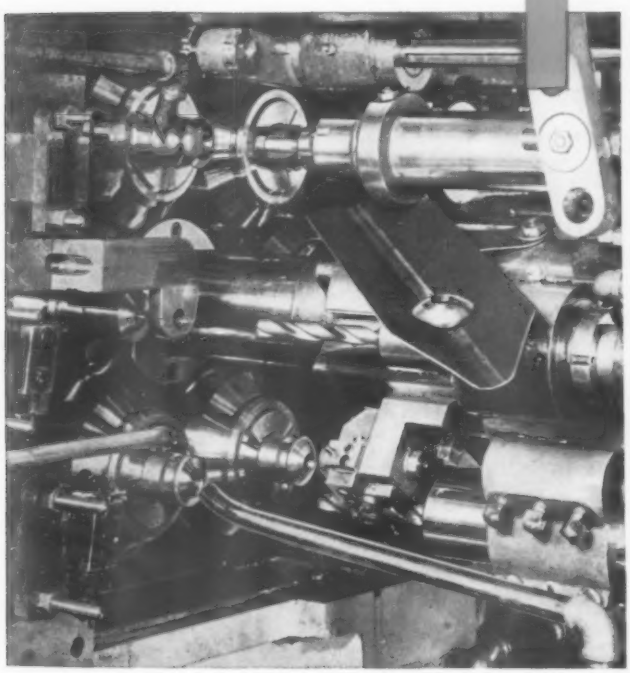


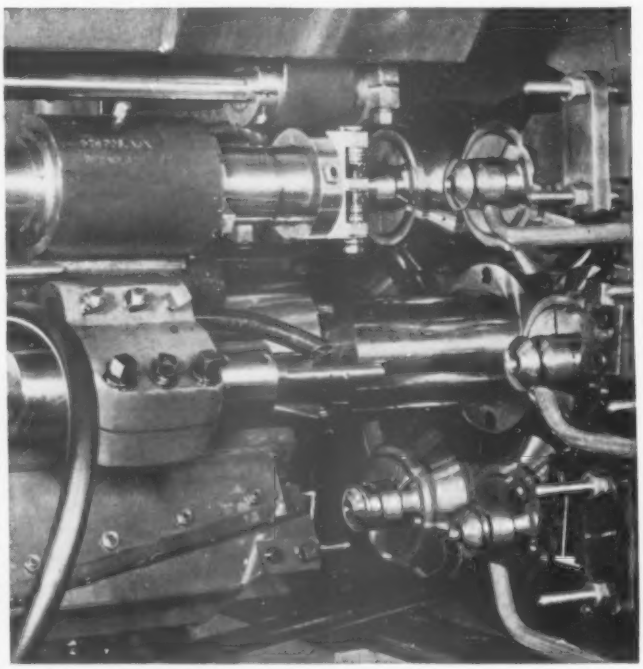
In the production of alloy steel bevel gear blanks on a 2⅝-SIX CONOMATIC, the "all position" endworking attachment facility simplifies the face and hole burnishing operations.

"AUTOMATICS" are good examples of mechanized teamwork. Their main function is to follow through and keep running. But a weak frame, a cramped tooling area, or an inadequate tool support, of one machine alone, can lower the production average of an entire battery.

The extra values that pay off in an "automatic" are not just *wished* into the machine; they are *built* there. And only complete information will disclose whether or not they *are* built there. You may have complete information on CONOMATICS.

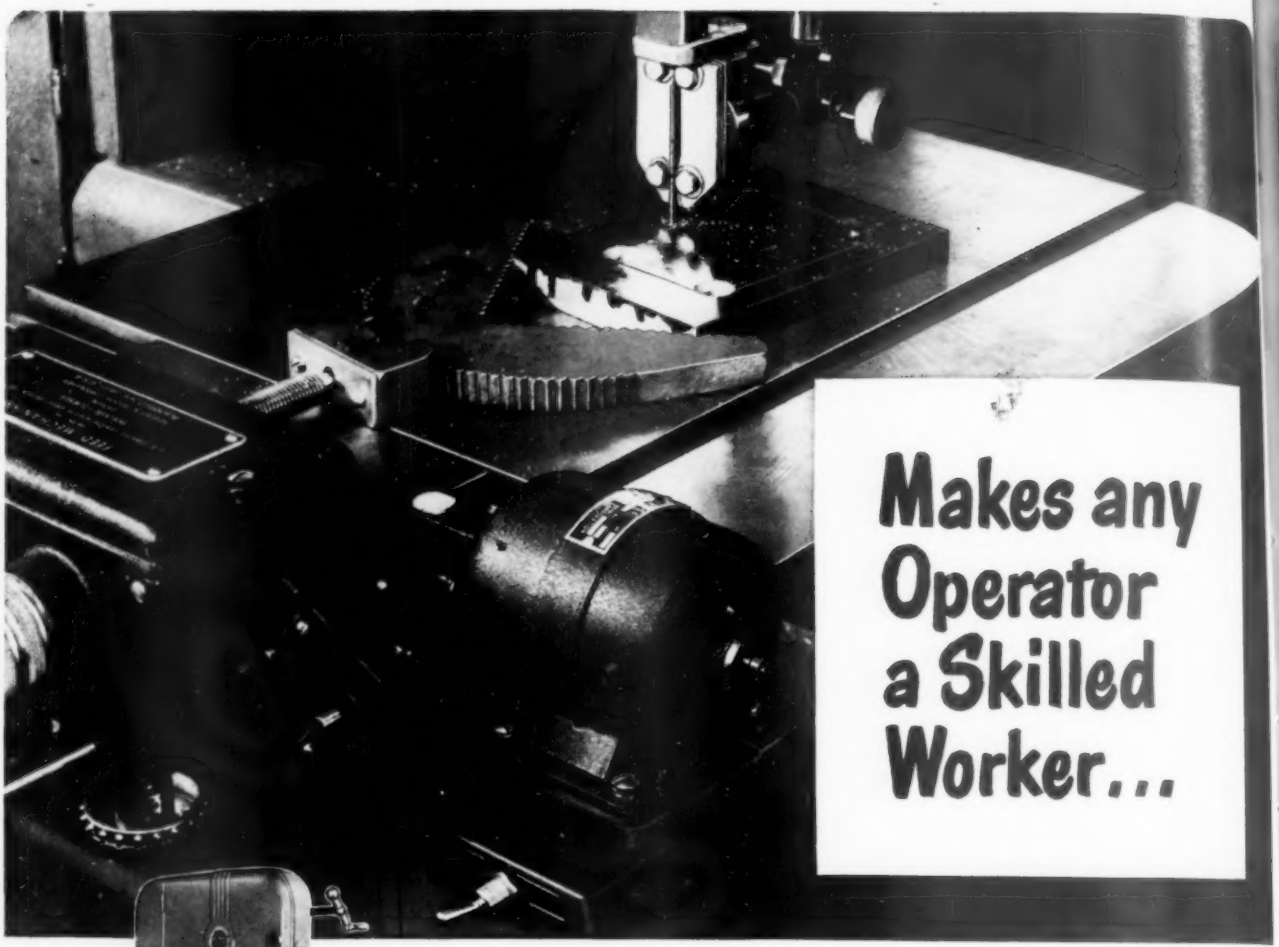
A Comparison of ALL Automatics is in favor of Cone





FRONT AND REAR SIDES OF TOOLING AREA

Conomatic CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



Makes any Operator a Skilled Worker...

New WALKER-TURNER BAND SAW with *Automatic Feed*

Almost anyone who can throw a switch can do precision-cutting on this band saw. An Automatic Power Feed (one of the most effective methods of cutting metal ever developed) actually leaves little for the operator to do.

Motor driven and automatically controlled by the resistance encountered at the cutting edge, this revolutionary mechanism designed by Walker-Turner maintains a *pre-set* feeding pressure. No more costly blade failure and work stoppage. You *can't* overload a blade with Walker-Turner Power Feed!

Today, with production schedules stepped up and shortages of skilled labor rapidly developing, here's the machine for profitable operations. Cuts sheets, rods, and tubes of steel, iron, aluminum, brass, alloys and compositions, as well as molded plastics.

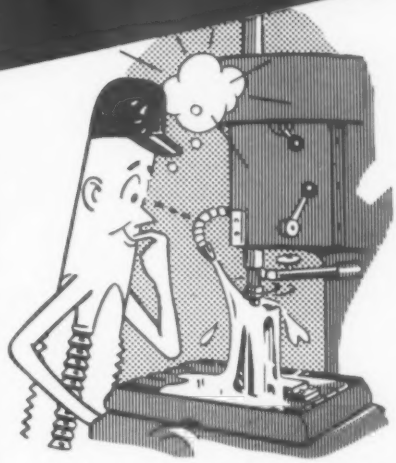
Ask your Walker-Turner distributor to show you the new Band Saw with Automatic Power Feed. Operate it yourself and see how Walker-Turner *design* can help you increase production and lower machining costs. Or write on your company letterhead for full information.

SOLD ONLY THROUGH AUTHORIZED DEALERS

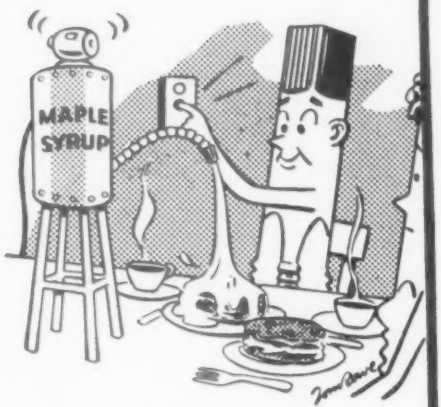
WALKER-TURNER
• DIVISION •
KEARNEY AND TRECKER CORPORATION
PLAINFIELD, N. J.

DRILL PRESSES • RADIAL DRILLS • TILTING ARBOR SAWS • BELT and DISC SURFACERS
LATHES • METAL-CUTTING BAND SAWS • SPINDLE SHAPERS • JOINTERS

TAP-ODDITIES



Production Pete would "get ideas"—
In the shop, they called him "sappy".
But like every other genius
He was just a bit "tap-happy".



Instead of coolant, on the work,
Now Pete gets all the breaks.
With a constant flow of syrup
On his daily buckwheat cakes!

Are you "tap happy"—that is, are you happy about the efficiency of the taps you are using in production?

You don't have to be a genius to discover the superior qualities of BATH "ground from the solid" taps. A trial will convince you that Bath Taps are uniform . . . will cut threads of high quality and perfect accuracy . . . will keep the cost per threaded hole down to a minimum!

Bath Taps are available in many stock sizes and types . . . and experienced Bath engineers specialize in the design of custom built taps for unusual jobs.

Insist on Bath "ground from the solid" Taps and you'll always be "tap-happy" about your production schedules.

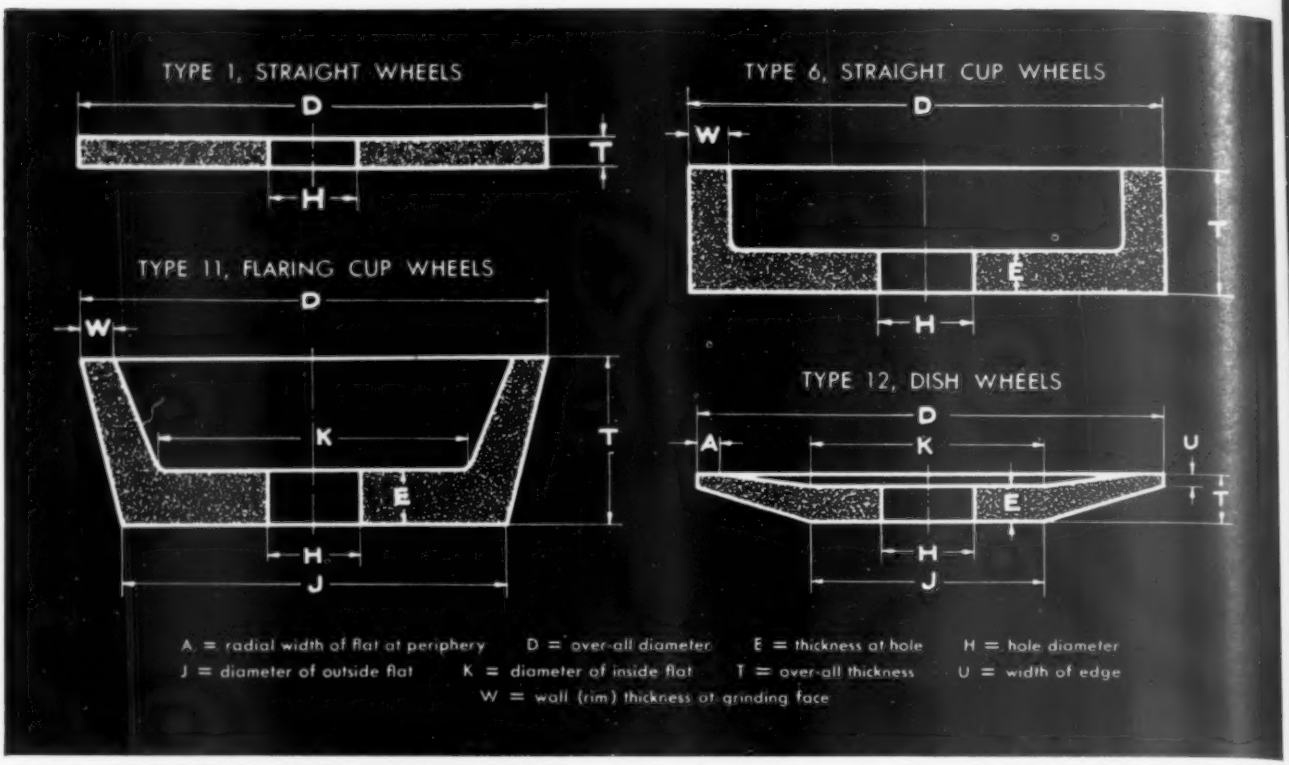
INSIST ON BATH TAPS
—PROFIT BY THEIR
PLUS—PERFORMANCE

JOHN BATH CO. INC. · WORCESTER · MASS.

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED

28 Grafton St., Worcester, Mass.



WHAT ARE STANDARD GRINDING WHEELS? They are the sizes and shapes selected by the National Bureau of Standards on the basis of: (1) widest use by industry; (2) widest range of adaptability to modern grinding equipment; and (3) most commonly carried in manufacturers' and distributors' stocks.

Specifically, in tool grinding wheels alone, there are 72 different "standards" in the four types shown above. For your convenience, they are listed in easy-to-read charts in "Standard Shapes and Sizes of Grinding Wheels" issued with the permission of the National Bureau of Standards.

How standard grinding wheels help you 3 ways

1. When you *specify* standard sizes and shapes of all grinding wheels, you stand a better chance of getting prompt delivery. That's because grinding wheel manufacturers make more "standards" and stock more of them.

2. When you *order* "standards" instead of "specials," you tie up less money in inventory, since you cut down on the number and variety of wheels you have to stock.

3. When you *use* "standards," you benefit from carefully engineered strength at *all* vital points in *every* standard grinding wheel.

Yes, indeed, standard sizes and shapes of grinding wheels help you save time, money, and trouble.

IT'S EASY TO ORDER "STANDARDS." Just check your present wheels against the simple charts in the bulletin "Standard Shapes and Sizes of Grinding Wheels," if you already have a copy. If you haven't, check the coupon below and mail it today.

GRINDING WHEEL INSTITUTE, 2130 Keith Bldg., Cleveland 15, Ohio

Please send me my copy of "*STANDARD SHAPES AND SIZES OF GRINDING WHEELS.*"

Also the following checked booklets to help me improve my use of grinding wheels:

☐ Safe Speeds for Grinding Wheels ☐ Safe Rules for Disc Grinding ☐ Mounting Techniques for Wheel Sleeves on Cylindrical Grinding Machines ☐ Safe Operation of Portable Grinding Machines ☐ Safe Rules for Handling, Storing and Inspecting Grinding Wheels ☐ Maintenance Recommendations of Heavy Speed, Heavy Duty Swing Frame and Floor Stand Grinding Machines ☐ Standard Specifications of Segments Used in Chucks ☐ Safety Code: The Use, Care and Protection of Abrasive Wheels

Name ..... *Title* .....

Address .....

City ..... *Zone* ..... *State* .....

HERE'S THE COMPLETE "ACORN" STORY— a Body, a Die, a Cap. Put them together and you have a really positive, rugged and accurate high production threading tool. And the test plug packed with every "Acorn" Die is tangible proof that it has been **performance tested** at the factory. Cutting sizes 0-80 to 1½"-12." Holders, including a releasing model, for many types of machines.

GREENFIELD TAP and DIE CORPORATION

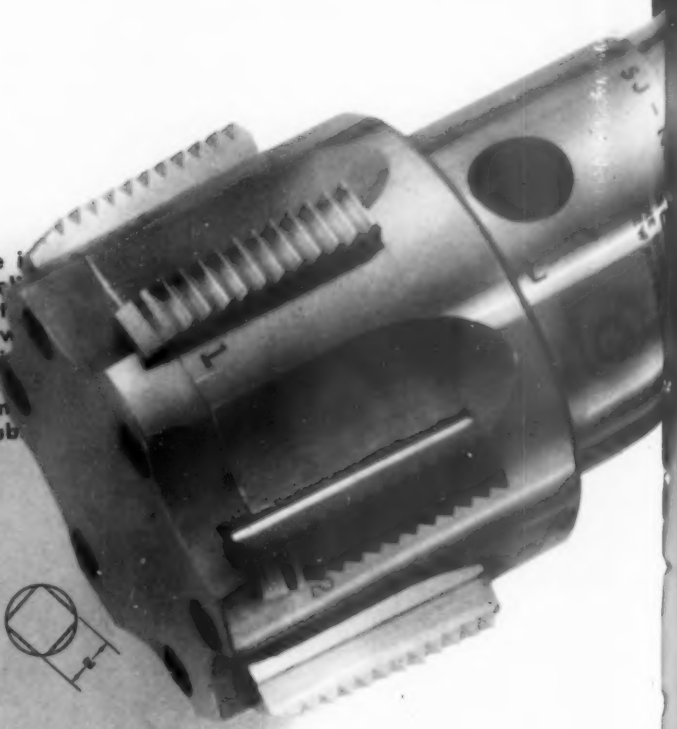
GREENFIELD, MASSACHUSETTS

solid adjustable tap

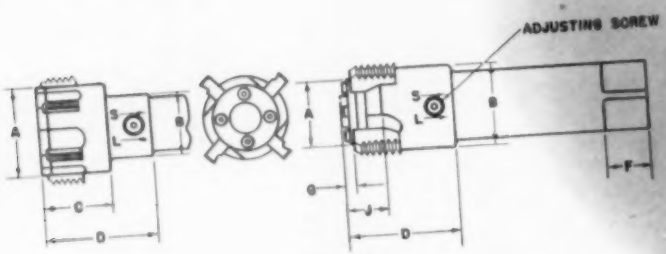
GEOMETRIC SJ

Bulletin SJ 4 pages

Class SJ



Where time for backing out is unimportant, where space i
limited, or wherever a solid tap is desired, the Class SJ So
Adjustable Tap is recommended. Within its size range, t
simple tap will do any job that a conventional solid tap w
do, and in addition can be adjusted to required decimal si
or fits. Furthermore it may be used for more than one siz
pitch by the use of interchangeable chasers. Its compactn
makes the SJ ideal for machines demanding a short, stub
tap, or when overhang must be avoided.



SPECIFICATIONS CLASS SJ TAPS

Style and Size Inches	CAPACITY			Code Word	A	B	C	D	‡E	‡F	G a	H aa		SHANKS							
	Straight Threads		Std. Pipe Thds.											Standard			Also available				
	Diam. Inches	Depth	Coarsest Pitch														Max.		Min.		
														Dia.	Lgt.	Morse Taper	Dia.	Lgt.	Dia.	Lgt.	
SJ-1	1 5/16–1 5/8	Limited Only by Diameter and Length of Shank	11	1*	Easer	1 3/32	1 5/32	.....	2 3/8	3/4	3/4	5/32	1/32	27/32	1	5	4	1 1/4	5	3/4	1 1/2
SJ-1 1/4	1 5/8–1 7/8		11	1 1/4	Eclat	1 7/32	1 3/8	.....	2 1/2	15/16	15/16	5/32	1/32	5/8	1 1/4	5	4	1 1/4	5	3/4	1 1/2
SJ-1 1/2	1 7/8–2 1/4		11	1 1/2	Edify	1 3/8	1 5/8	.....	2 3/4	1 1/8	1 1/8	3/16	1/16	7/8	1 1/2	5	4	1 1/2	5	1	2
SJ-2	2 1/4–2 3/4		11	2	Educe	1 5/8	2 1/16	.....	2 3/4	1 1/2	1 1/2	3/16	1/16	1	2	5	4	2	5	1	2
SJ-2 1/2	2 3/4–3 1/2		8	2 1/2	Egypt	2 3/8	2 3/8	.....	3 3/4	1 11/16	1 11/16	1/4	1/16	.....	2 1/4	6 1/4	5	2 1/4	6 1/4	1 1/4	2 1/2
SJ-3	3 1/2–4 1/4		8	3	Eland	3	2 3/8	2 1/2	4 1/4	1 11/16	1 11/16	1/4	1/8	.....	2 1/4	6 1/4	5	2 1/4	6 1/4	1 1/4	2 1/2
SJ-3 1/2	4 –5		8	3 1/2–4	Elect	3 1/2	2 3/8	2 1/2	4 1/4	1 11/16	1 11/16	1/4	1/8	.....	3	8 3/4	6	3	8 3/4	1 1/2	3
SJ-4	4 1/2–5 3/4		8	4 –4 1/2	Elfin	4	3 1/8	3 1/16	5 1/8	2 1/4	2 1/4	1/4	1/8	.....	3	8 3/4	6	3	8 3/4	1 1/2	3
SJ-4 1/2	5 –6 1/2		8	4 1/2–5	Elian	4 1/2	3 1/8	3 1/16	5 1/8	2 1/4	2 1/4	1/4	1/8	.....	3	8 3/4	6	3	8 3/4	1 1/2	3
SJ-5	5 1/2–7 1/4		8	5 –6	Ember	5	3 1/8	3 5/16	6	2 13/16	2 13/16	5/16	1/8	.....	3 3/4	8 3/4	6	3 3/4	8 3/4	1 1/2	3
SJ-6	6 1/2–8 1/2		8	6 –7	Epoch	6	3 1/8	3 5/16	6	2 13/16	2 13/16	5/16	1/8	.....	3 3/4	8 3/4	6	3 3/4	8 3/4	1 1/2	3

Chasers interchange in Class "S" Taps. * 1" Pipe recommended only for free cutting materials where work has been taper reamed to size.
‡Standard straight shanks are furnished unless otherwise specified. Where required, ends of shank will be squared per dimensions "E" and "F" without extra charge.
a G = Distance from front of Chaser to front of Cap. aa H = Amount projection Chasers extend beyond Cap.
NOTE: Separate taps recommended for right and left hand tapping. Taps for right hand furnished unless otherwise specified.

GEOMETRIC TOOL COMPANY DIVISION
Greenfield Tap and Die Corporation
NEW HAVEN 15, CONNECTICUT

How the Fable of

"The Birds, The Beasts & The Bat"

has a parallel in Cutting Fluids

. . . thanks to Aesop for this Fable

The Birds were engaged in a fierce battle with the Beasts. The Bat figured he could pass as either a Bird or a Beast and he wanted to be on the winning side. As the battle see-sawed he flitted back and forth. The Birds finally won but the Bat got back to their side too late and was chased away to a cave, where he has lived ever since, ashamed to come out except at night.

The Parallel . . .

Like the Bat in the fable, some cutting fluids appear to be both Bird and Beast, but may be neither. If you are going to tap a tough, difficult to machine metal you need a heavy duty cutting oil with high *anti-weld* and good *lubricity* characteristics. On a less exacting light milling job a conventional water-mix fluid with good temperature regulating properties is usually the answer.

The point the fable emphasizes is that a cutting fluid can't be on both sides of the fence. You don't need a different fluid for every job but you need one that's *right* for the job. Stuart products and Stuart experience will give you the best possible results in terms of finish, tool life and production. Ask to have this demonstrated to you by a Stuart Representative.

More Than a "Coolant" is Needed

D. A. Stuart Oil Co.
EST. 1865 LIMITED

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

2727-49 S. Troy St., Chicago 23, Ill.

SEND FOR BOOKLET entitled *More Than a "Coolant" is Needed*

CLIP TO YOUR COMPANY LETTERHEAD AND MAIL

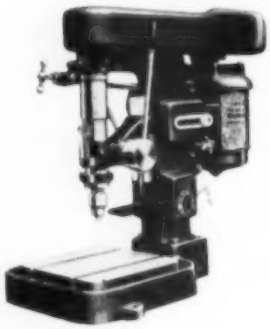
to D. A. Stuart Oil Co., Ltd., 2727-49 S. Troy St., Chicago 23, Ill.

Your Name .....

Title .....

THE WEBO LINE

PRECISION AND PRODUCTION DRILLING MACHINES

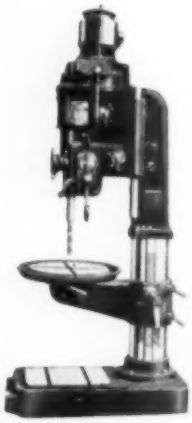


MODEL TS-1

THE WEBO LINE OF SENSITIVE DRILLING MACHINES

has proven itself unusually efficient because of the higher spindle speeds made possible by its extreme precision and dynamic balancing of all rotating parts. Available in bench or floor models with box or round column, and also as multiple spindle units.

Model TS ½ Capacity to ⅛" Spindle Speeds to 18000
Model TS 1 Capacity to ¼" Spindle Speeds to 19000
Model TS 3 Capacity to ½" Spindle Speeds to 7000
Model TS 4 Capacity to ¾" Spindle Speeds to 4010

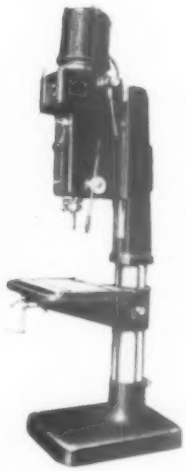


MODEL V-6

THE WEBO MODEL B16 DRILLING MACHINE

is designed to fill the most exacting demands encountered in tool room use. The infinitely variable speeds and the extreme precision make this sturdy model ideal for all types of drilling. Available in box column, also round column, 7½" diameter, and multiple spindle units.

Model B-16
Capacity to ⅝"
Spindle Speeds to 2400
Infinitely Variable
H.P.—1½—2



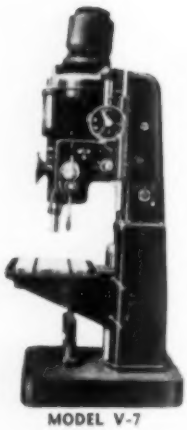
MODEL B-16

THE WEBO LINE OF POWER-FEED DRILLING MACHINES

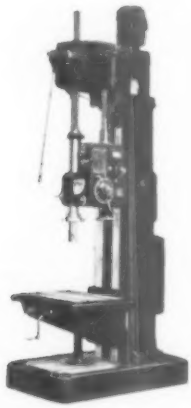
Designed for heavy duty production drilling to tool room tolerances. Finest workmanship and materials assure long dependable machine life and minimum cost of upkeep. Available in box and round column and multiple spindle units.

SPECIFICATIONS	V4b	V5	V6	V7
Capacity (in SAE 1045)	¾"	1"	1⅜"	2"
Speeds	105 to 2550*	85 to 2880*	75 to 2680*	66 to 980*
Number of Feeds	3	3	4	8
H.P.	2	2½	3	5½

*In 3 Speed Ranges infinitely variable to suit requirements



MODEL V-7



MODEL BK-65

THE BK65 WEBO HEAVY DUTY DRILLING MACHINE

with *dual* power feed (for head and spindle) is the ideal machine for deep hole drilling.

SPECIFICATIONS

Capacity—(in SAE 1045) 2½"
Spindle Speeds 12
Power Feeds 9
Maximum Drilling Depth 28"
Available in four ranges
H.P. 10/12

KLINGELHOFER MACHINE TOOL CO.
Kenilworth, New Jersey

KLINGELHOFER

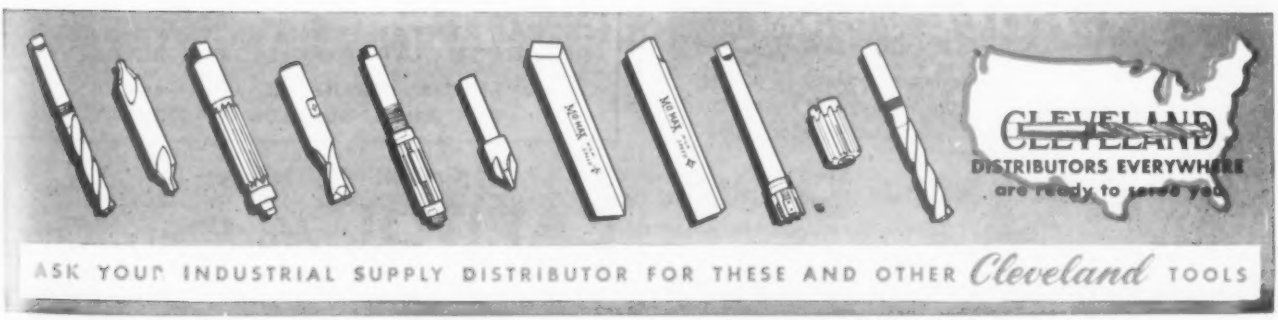
est proves that *Better Wearing Qualities* give you 42%

MORE HOLES PER GRIND

It was a smooth-running job—drilling 1 1/32" holes in a cast iron cover, ½" thick—but the superintendent wasn't satisfied with the wearing qualities of the high speed drills that were being used. They averaged 2705 holes per grind. ◇ When a *Cleveland* Service Representative was called in, he recommended a stock CLE-FORGE High Speed Drill that is engineered to reduce the wear caused by abrasive action. With no change in feed or speed, this drill averaged *3862* holes per grind! ◇ On *all* drilling operations, a *Cleveland* Service Representative can help you *speed the job* and *cut costs.* Contact our nearest Stockroom, or . . .

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58
E. P. Barrus, Ltd., London W. 3, England



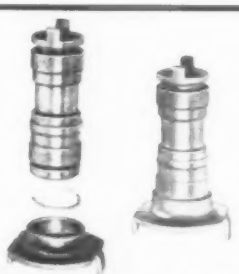
ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS

EASY-FLO ... the Key to Modern Design and Production

● Recently a new cylindrical lock was developed for the Russell & Erwin and P. F. Corbin Divisions of the American Hardware Corp. Parts were designed for EASY-FLO brazed construction and results verified once more the speed, reliability and low cost of this modern method of fabricating metal assemblies.

HOW PARTS ARE BRAZED ...

At left below are the Case assembly parts—a brass sleeve and stamped steel case and ring of EASY-FLO wire used to join them—and under them is the brazed assembly. Jigged assemblies, with alloy pre-placed, are induction brazed 6 at a time (see right). Heating time per 6 assemblies—31 seconds. Three other assemblies are EASY-FLO brazed by the same method —



KNOB SHANK—steel shank to stamped steel cap—heating time, 6 assemblies, 12 seconds.

LATCH CASE—steel cap to steel case — heating time, 6 assemblies, 8 seconds.

CAP—brass sleeve to steel stamping—heating time, 6 assemblies, 40 seconds.

GET THE WHOLE EASY-FLO BRAZING STORY

BULLETIN 20 tells you in detail what EASY-FLO is, what it does and how to put it to work—plus valuable information on joint design and fast brazing production methods. Write for a copy today.

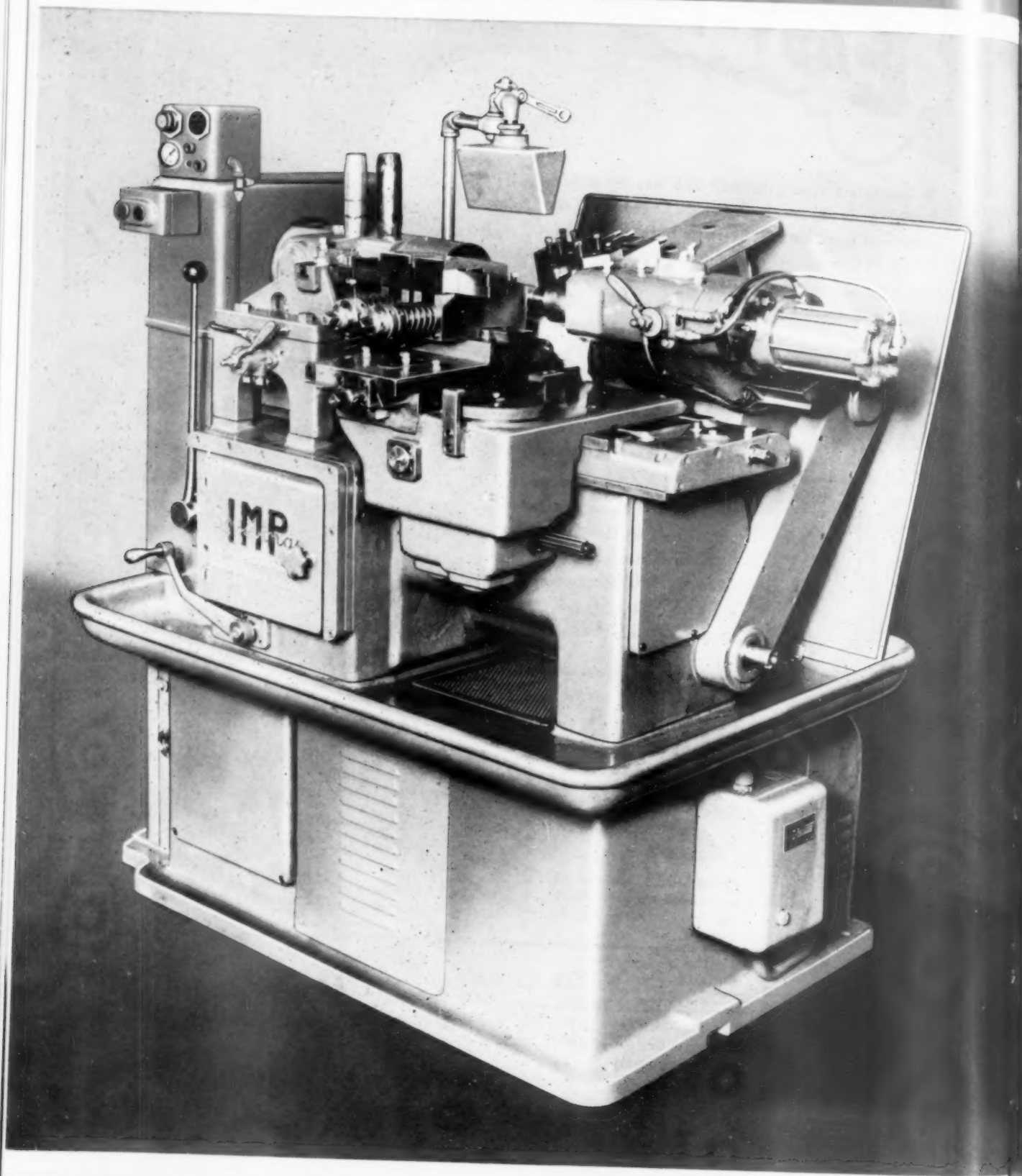
85th Anniversary — HANDY & HARMAN FOUNDED 1867 QUALITY · SERVICE

HANDY & HARMAN

General Offices: 82 Fulton St., New York 38, N. Y.
DISTRIBUTORS IN PRINCIPAL CITIES

OFFICES and PLANTS
BRIDGEPORT, CONN.
PROVIDENCE, R. I.
CHICAGO, ILL.
CLEVELAND, OHIO
DETROIT, MICH.
LOS ANGELES, CAL.
TORONTO, CANADA

MACHINE OF



PRODUCTION COSTS

THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

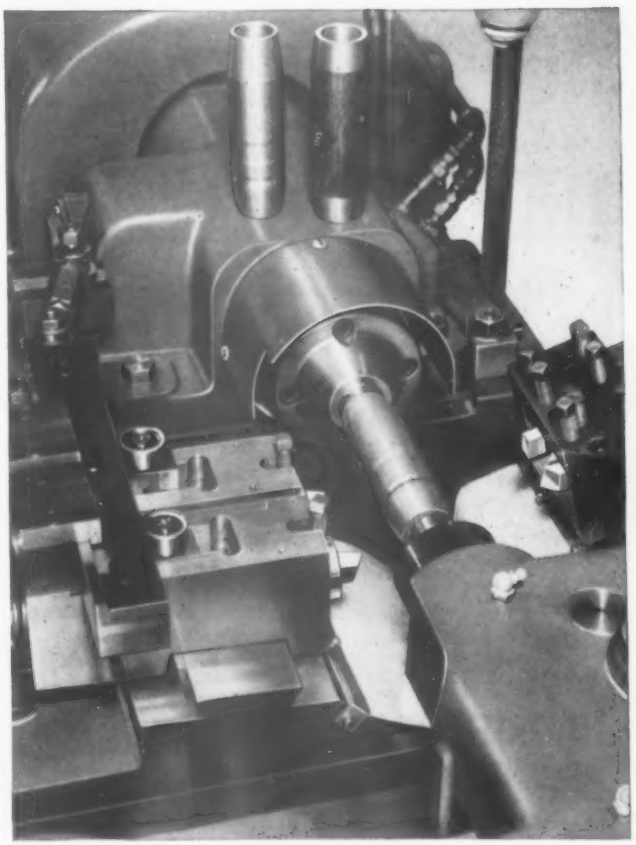
Lo-swing IMP LATHE FINISH TURNS 40 MM SHELL IN ONE OPERATION

Problem: To finish turn 40 mm high explosive shells, approximately 1.57" diameter x 5.17" long, maintaining close concentricity between OD and bore and obtaining an accurate, high-class finish.

Solution: The Automatic Lo-swing IMP Lathe was chosen for this work because its spindle construction with direct "V" belt drive permits turning with sintered carbide tools at the very high surface cutting speeds necessary to assure a polished finish. Also, other features of IMP design assured the rigidity and turning accuracy which this job demanded.

The work is held and driven at the head end by an air-operated expanding collet chuck. The tailstock end is supported by a revolving, expanding bushing which enters the small diameter bore. The OD is turned the full length of the piece with 2 template-controlled tool blocks... finish turning the nose, the boat tail and the cylindrical body. Simultaneously, a 3-tool block on the automatic back squaring attachment faces and chamfers one end and machines the cartridge crimping groove.

Movements of both front and rear slides are synchronized and the machine stops automatically with tools and slides returned to starting position. The tailstock is air-operated to speed up handling time.



Close-up of tooling with covers removed on template-controlled tool blocks to show construction. Note rough and finish turned pieces on headstock. Work is first drilled, reamed and ends rough bevelled on an 8-spindle lathe before coming to the IMP.

SENECA FALLS MACHINE CO., SENECA FALLS, N.Y.

ARE LOWER WITH Lo-swing

FOR YOUR TOUGH DRILLING JOBS

Atlas CLAUSING
PRECISION MACHINE TOOLS
DIVISION
ATLAS PRESS COMPANY
KALAMAZOO, MICHIGAN U. S. A.

18" HEAVY DUTY PRECISION DRILL PRESS

Greater spindle travel for more efficient use of quick-release production chucks! Greater maximum distance from spindle to table! Bigger diameter spindle for larger tool capacity! Positioning mechanism that moves *both* head and table! Vernier depth stop control for .001" depth accuracy! More rugged and massive head, table and column construction! These are just a few of the reasons why the Clausing 18" drill press gives you new speed, ease, and precision on heavy-duty drilling.

Construction of head, spindle, quill, and bearings of the Clausing 18" drill assure precision work and lasting accuracy. Quill guides, drive bearing housing, and column bearings are line bored. Spindle is $^{63}/_{64}$" precision-ground steel. Quill is also precision-ground steel, 2⅜" in diameter with $^{5}/_{16}$" thick walls. Spindle turns on precision-type ball bearings spaced 8½" apart. Upper bearing is sealed-for-life. Note the special double-row double-shielded lower bearing — BOTH races of lower bearing absorb drill radial and thrust. Bore is No. 3 Morse Taper. The Clausing is the only 18" drill providing all these features for greater tool and job capacity. Send for new catalog with complete details.

CLAUSING DIVISION
ATLAS PRESS COMPANY
7114 N. Pitcher St., Kalamazoo, Mich.

"The high standards set for our product"... met by MEEHANITE castings

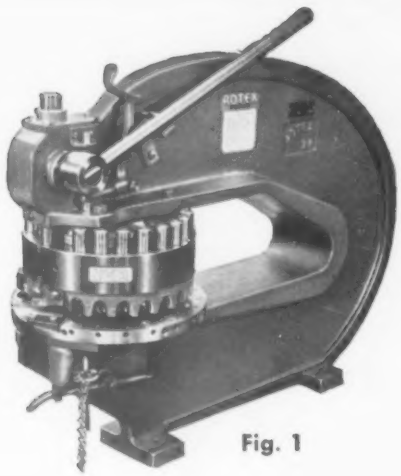


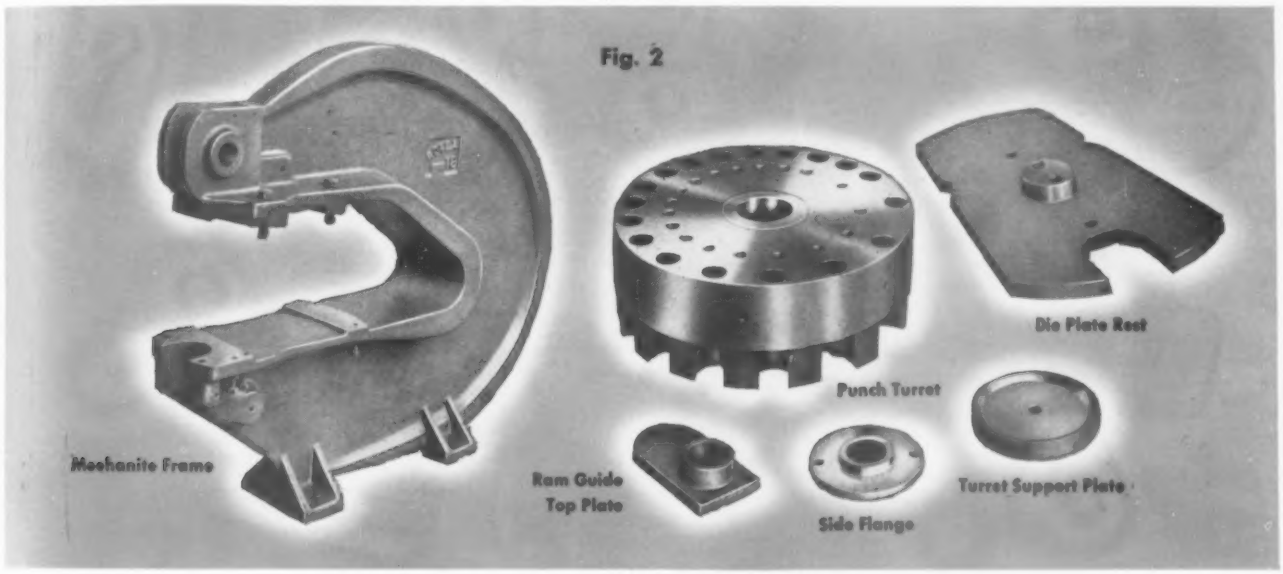
Fig. 1

The headline quoted above is a statement made by the Rotex Punch Company, Oakland, California, manufacturers of a line of Quick Change Punch Presses (Fig. 1). Meehanite castings are used exclusively in the manufacture of these presses and the manufacturer states further: "The reason for this choice is because of their higher tensile strength, a consistent absence of blow holes and hard wearing qualities. We also find that Meehanite castings are very readily machined."

The fundamental components are shown in Fig. 2.

This is another example of the maintenance of high quality standards through the specification of Meehanite castings.

If you have a casting problem involving the need for something better, remember that "Meehanite Means Better Castings" and consult your Meehanite foundry.



Take *YOUR* Casting Problem To A MEEHANITE FOUNDRY

American Brake Shoe Co.	Mahwah, New Jersey
The American Laundry Machinery Co.	Rochester, New York
Atlas Foundry Co.	Detroit, Michigan
Banner Iron Works	St. Louis, Missouri
Barnett Foundry & Machine Co.	Irvington, New Jersey
E. W. Bliss Co.	Hastings, Mich. and Canton, O.
Builders Iron Foundry	Providence, Rhode Island
Compton Foundry	Compton, Calif.
Continental Gin Co.	Birmingham, Alabama
Crawford & Doherty Foundry Co.	Portland, Oregon
The Cooper-Bessemer Corp.	Mt. Vernon, Ohio and Grove City, Pa.
Empire Pattern & Foundry Co.	Tulsa, Oklahoma
Farrel-Birmingham Co., Inc.	Ansonia, Connecticut
Florence Pipe Foundry & Machine Co.	Florence, New Jersey
Fulton Foundry & Machine Co., Inc.	Cleveland, Ohio
General Foundry & Manufacturing Co.	Flint, Michigan
Greenlee Foundry Co.	Chicago, Illinois
The Hamilton Foundry & Machine Co.	Hamilton, Ohio
Hardinge Company, Inc.	New York, New York
Hardinge Manufacturing Co.	York, Pennsylvania
Johnstone Foundries, Inc.	Grove City, Pennsylvania
Kanawha Manufacturing Co.	Charleston, West Virginia
Lincoln Foundry Corp.	Los Angeles, California
E. Long Ltd.	Orillia, Ontario
Otis Elevator Co., Ltd.	Hamilton, Ontario
The Henry Perkins Co.	Bridgewater, Massachusetts
Pohlman Foundry Co., Inc.	Buffalo, New York
Rosedale Foundry & Machine Co.	Pittsburgh, Pennsylvania
Ross-Meehan Foundries	Chattanooga, Tennessee
Shenango-Penn Mold Co.	Dover, Ohio
Sonith Industries, Inc.	Indianapolis, Ind.
Standard Foundry Co.	Worcester, Massachusetts
The Stearns-Roger Manufacturing Co.	Denver, Colorado
Taylor Engineering & Mfg. Co.	Allentown, Pennsylvania
Valley Iron Works, Inc.	St. Paul, Minnesota
Warren Foundry & Pipe Corporation	Phillipsburg, New Jersey

"This advertisement sponsored by foundries listed above."

MEEHANITE® NEW ROCHELLE, N. Y.

PARKER • MAJESTIC PM PRECISION MACHINES

Above is pictured the home and products of the

PARKER-MAJESTIC, INC.

For almost a quarter of a century this company has manufactured the Parker Spindles used in Precision Grinding, Boring and Milling applications. Additional products include the well known line of Parker-Majestic Internal, External, No. 2 Surface and Rotary Surface Grinders.

Descriptive literature upon request.

PARKER-MAJESTIC, INC.

formerly **MAJESTIC TOOL & MFG. CO.**

147 JOS. CAMPAU • DETROIT 7, MICHIGAN

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

In the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

Our Brake Die Steel Solves Wear and Warp Problems

We've never introduced a more popular specialty steel. And there are good reasons why more and more shops are becoming regular customers for our Brake Die Steel. One distributor writes: "Your Brake Die Steel is going over big out here. Not only does it machine easily, but it holds its size and shape beautifully." Another says: "My customers are highly pleased because it wears and wears . . . die costs have been cut in half."

Many shops are accustomed to using just any kind of steel. Now they're finding it's a whale of a saving to use a steel that's specially intended for dies used in sheet-metal brakes.

Our Brake Die Steel saves time and money right at the start because we ship it in the heat-treated condition — it's ready to machine, needs no further hardening. Every bar is carefully heat-treated by oil-quenching and tempering. Then it is straightened, stress-relief-annealed and straightened again so that it won't warp when machined to contour by the die-maker.

Here's a steel you can count on to *stay* straight. Best of all, it far outwears ordinary steels.

We stock Bethlehem Brake Die Steel in standard sizes in our Mill Depot; it's also stocked by many distributors of Bethlehem tool steels. Folder 560 gives full details.

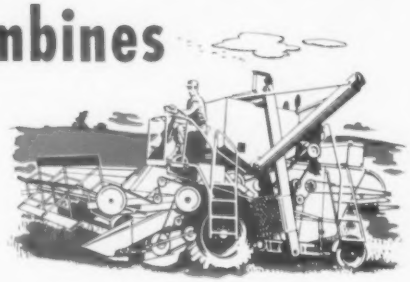
This four-way die is typical of the uses of our Brake Die Steel.

Lehigh H Tool Steel Helps Build Big Grain Combines

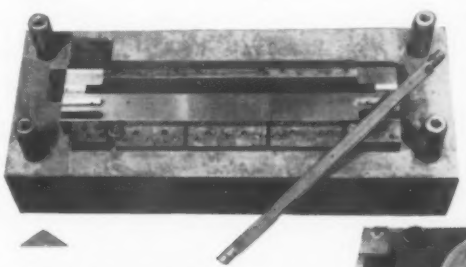
It's easy to see why the modern self-propelled combine makes old-timers blink in admiration and wonder. One such machine made by Gleaner Harvester Corp., Independence, Mo., requires but one man at the controls. It performs a continuous harvesting operation as it cuts a 14-ft swath through vast fields. Cleaned grain pours into a 50-bushel bin in a steady stream. In just 90 seconds the bin can be unloaded while the machine continues on the go.

It takes precision manufacturing to make these mechanical marvels run smoothly and dependably. And that's where Bethlehem tool steel comes in.

Our Lehigh H tool steel, for example, is used for a variety of tools and dies that turn out many vital combine parts from sheet steel. Gleaner's well-equipped toolmaking division reports complete satisfaction with this fine grade of air-hardening tool steel. Its high-carbon, high-chromium content makes it first choice for high production because of its long-wearing properties. And it has minimum distortion during heat-treatment.

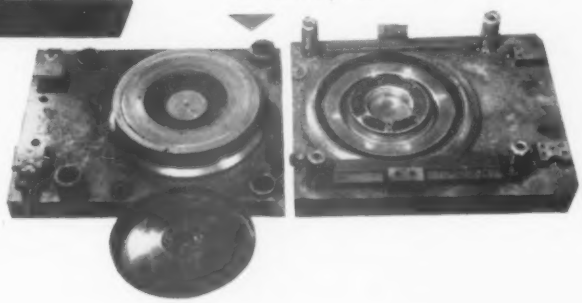


This Gleaner-Baldwin self-propelled combine does everything but bake the bread as it cuts a 14-ft swath in a wheat field. It's a one-man operation.



Raddle slats, which convey the crop to the combine separator, are produced from 12-gage sheet steel by this die of Lehigh H tool steel which forms, pierces, and cuts off. Die shown has already produced about 100,000 pieces.

Lehigh H is also used in this blanking, flanging, and dishing die which produces a 17-in.-diameter cylinder head for the threshing mechanism. This die operates in a 400-ton press.



BETHLEHEM TOOL STEEL ENGINEER SAYS:

Use Shock Steels for Shock Tools

When using standard manganese oil-hardening tool steels (such as our BTR grade) for jobs requiring more than average shock-resistance, the usual practice is to temper the tool or die so that the hardness is reduced to about 50 Rockwell C. This is not recommended, because at a given hardness a steel of this type, having a relatively high carbon content, can't match the shock properties of a lower-carbon, shock-resisting steel.

If a tool has to be tempered that far to get the necessary toughness, then probably a shock-resisting steel should be used rather than a general-purpose steel. Omega, our silico-manganese steel, is ideal for all types of cold-battering tools . . . and 67 Chisel, our chrome-tungsten grade, is the steel to use for a wide variety of shock tools and master hobs.

Experience Tells!

Because R and L Tools are made by men who understand your problem, they are precision perfect. Rough, heavy, or finished cuts are mastered easily and completed quickly with the Turning Tool. Only one of the many advantages of the R and L Turning Tool, this masterpiece is the result of over 45 years in the precision tool field.

Write for complete catalog

RIGHT R and L LEFT TOOLS

1825 BRISTOL STREET • PHILADELPHIA 40, PA.

TURNING TOOL • TAP AND DIE HOLDER • UNIVERSAL TOOL POST • TURRET BACKREST HOLDER • CUT-OFF BLADE HOLDER • RECESSING TOOL
RELEASING ACORN DIE HOLDER • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL • CARBIDE AND ROLLER BACKRESTS

F EE Cylinder Catalog a d Templates offered b Ortman-Miller Co.

Bo k outlines several special f atures of O-M cylinders.

FREE

A new, 28 page catalog has just been released by the Ortman-Miller Machine Co. which gives complete engineering specifications, data on O-M's special internal locking system and special full listing of O-M parts. Prepared for designers and users of cylinders for any application, it covers standard, oversize and 2-1 piston rods, giving full information on all sizes from 1½" to 8" bores.

SPECIAL FEATURES

Included are detailed explanations of the many features which have made ORTMAN-MILLER cylinders standard in thousands of plants throughout the country. Detailed drawings and copy explain the special shear bar assembly which completely eliminates bulky end caps and tie rods, thus saving up to ⅓ in space. In addition, it shows the vast number of interchangeable mountings and applications which almost always eliminate the need for special castings or patterns. This feature alone not only saves initial costs, but cuts down on inventory and greatly speeds up delivery on every order.

Special Note:

30 DAY DELIVERY

Increased production facilities and standardization of parts continue to make possible delivery in 30 days or less on almost all orders for O-M cylinders. Write today for details.

FREE TEMPLATES

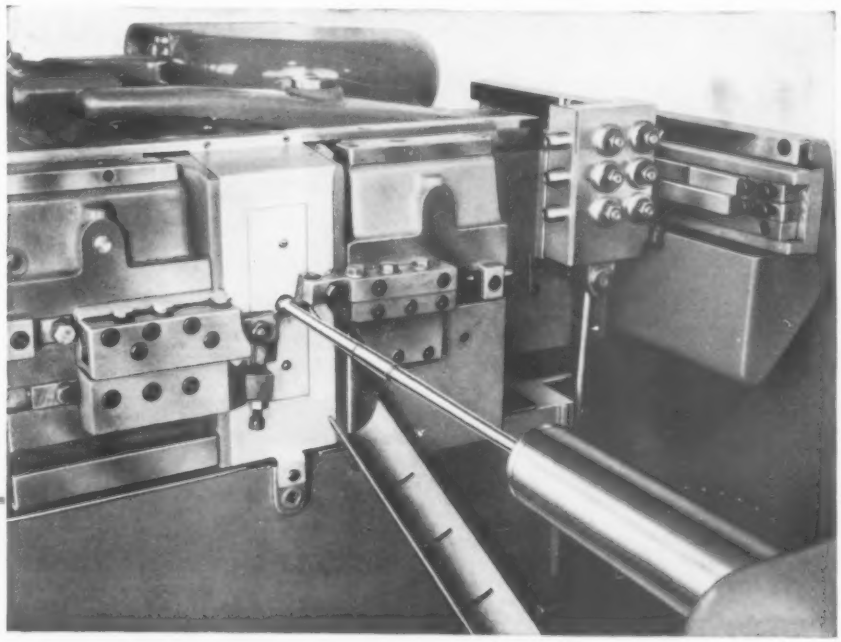
In addition to the FREE catalog, Ortman-Miller also leads the field in making available FREE TEMPLATES of all O-M cylinders. Prepared in half scale, they are extremely useful in design and application of O-M cylinders to your special requirements.

For your FREE Catalog or templates, use the coupon in the ad at the right. Or write to ORTMAN-MILLER Machine Co.,

TAVANNES

CAPACITIES TO
2⅜" DIA. & 21⅝" LENGTH

Single Spindle Automatic Lathe



View shows set-up to produce this 21⅝"-long piece.

Headstock feed permits all turning operations to be performed at point of support.

Rugged construction throughout. All tool adjustments readily accessible. Camming simple to make and apply.

SIX CROSS SLIDES
SIX END TOOLS

Precision • Flexibility • High Production by **TAVANNES**

AMERICAN REPRESENTATIVES

(UNITED STATES—EXCEPT WEST COAST)

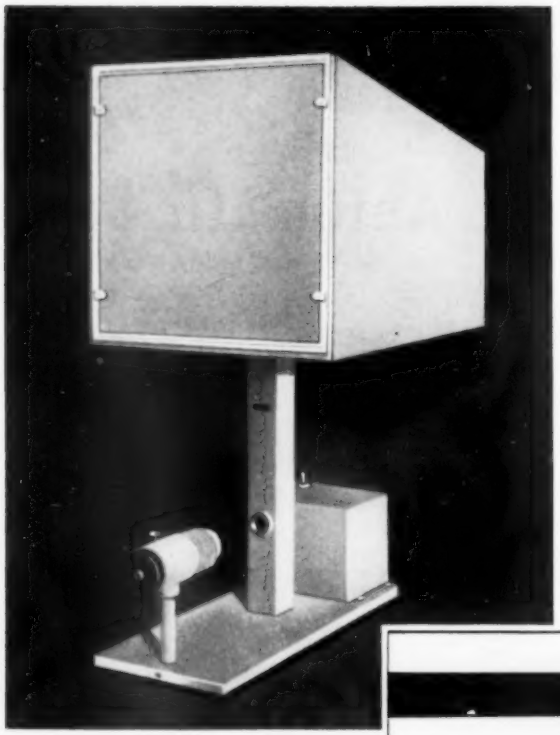
RUSSELL, HOLBROOK & HENDERSON, INC.

292 MADISON AVENUE, NEW YORK 17, N. Y.

(CALIFORNIA, OREGON, WASHINGTON)

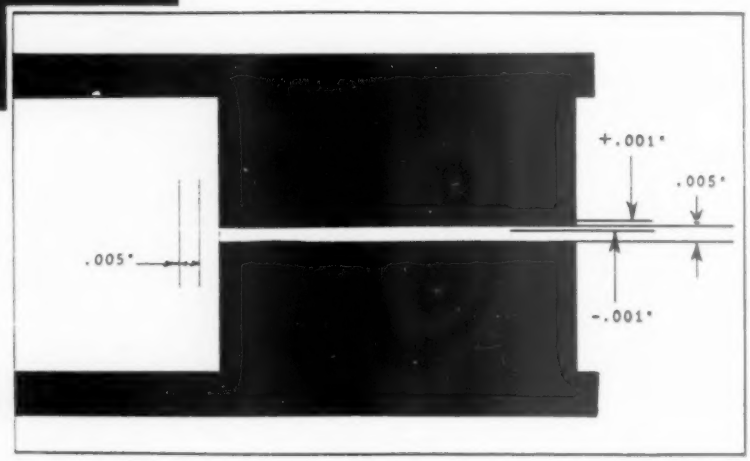
ART THOMAS MACHINERY CO.

2820 LEONIS BLVD., LOS ANGELES, CALIF.

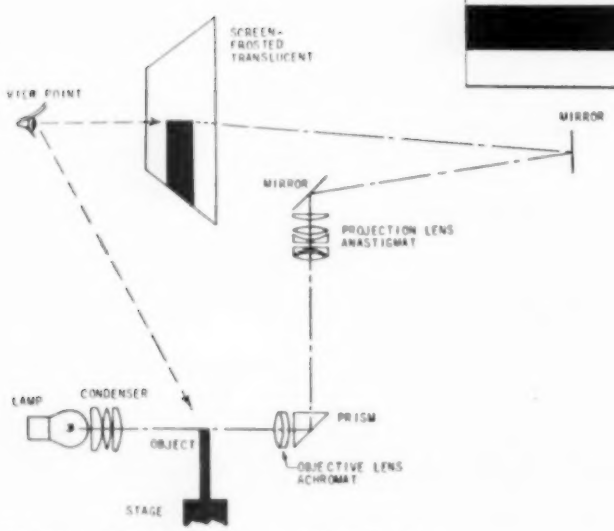


production line detective

STOCKER & YALE Model 100 HC Horizontal Contour Projector (Staging Fixture not shown) uncovers ERRORS, WASTE, and LOST TIME in Relay Manufacturers Production Line.



SCREEN IMAGE OF CORRECT CONDITIONS OF CONTACTS WITH LIMIT LINES TO WHICH ADJUSTMENTS ARE MADE.



OPTICAL SYSTEM—MODEL 100HC—The high intensity incandescent lamp and its condenser direct a uniform beam of light past the object and into the projection system. Fully corrected projection lenses and high quality prisms and mirrors then project the magnified image to the plain frosted screen against which overlay charts may be placed. Viewing is comfortably made directly forward.

Screen Image at 50 Magnifications allows inexperienced operators to accurately perform fine mechanical adjustments.

RESULTS

1. 1400% INCREASE IN PRODUCTION.
2. 97% REDUCTION IN BARE LABOR COST.
3. 100% FINAL INSPECTION REDUCED TO SPOT CHECK.
4. 3 WEEKS AMORTIZATION OF EQUIPMENT.

Write for Complete Application Story covering this problem.

Stocker & Yale
INCORPORATED

MARBLEHEAD, MASS.

Engineers • Manufacturers • Consultants • Research • Development

ROUND WORK

for a Water Pump

The six fins of water pump impeller blades are ground to a 15 degree angle on this No. 705 Besly-Bowen Wet Grinder. And at a production rate of 120 units per hour.

Besly experience in grinder design, engineering, and manufacture has served to produce improved and faster grinding in hundreds of instances. Here is an excellent example of the wide range of job possibilities for BESLY-BOWEN grinders. This awkward, unorthodox grinding job is handled easily, and with a typical BESLY-BOWEN elimination of slides and wearing parts.

All Besly-Bowen Grinders of basic design are readily adaptable to many specialized jobs. Talk to the Besly representative in your territory. Or — send the coupon below for more detailed information.

BESLY-BOWEN No. 705 WET GRINDER
with Automatic Cycle Grinding Control

In grinding these six fins to a common angle, the abrasive wheel is sheared across the blades which are rotated rapidly during the grinding cycle. Approximately 1/32" of stock is removed in a single pass, grinding the work to size and correct angle. Accuracy—Uniformity, Plus or Minus .003"

BESLY-BOWEN
GRINDERS

are Multi-Purpose Face Grinders and include models 3 horse power to 30 horse power, all available with Automatic Cycle Control

BESLY-WELLES CORPORATION
Established as Charles H. Besly & Company in 1875
118 DEARBORN AVE., BELOIT, WIS.

BESLY

BESLY GRINDERS and ACCESSORIES
BESLY TAPS, DRILLS, REAMERS
BESLY-TITAN ABRASIVE WHEELS

Besly-Welles Corporation
118 Dearborn Ave.
Beloit, Wisconsin

( ) Please send us Besly Disc Grinder Bulletin with detailed story of Besly-Bowen machines.

( ) Also have a representative call.

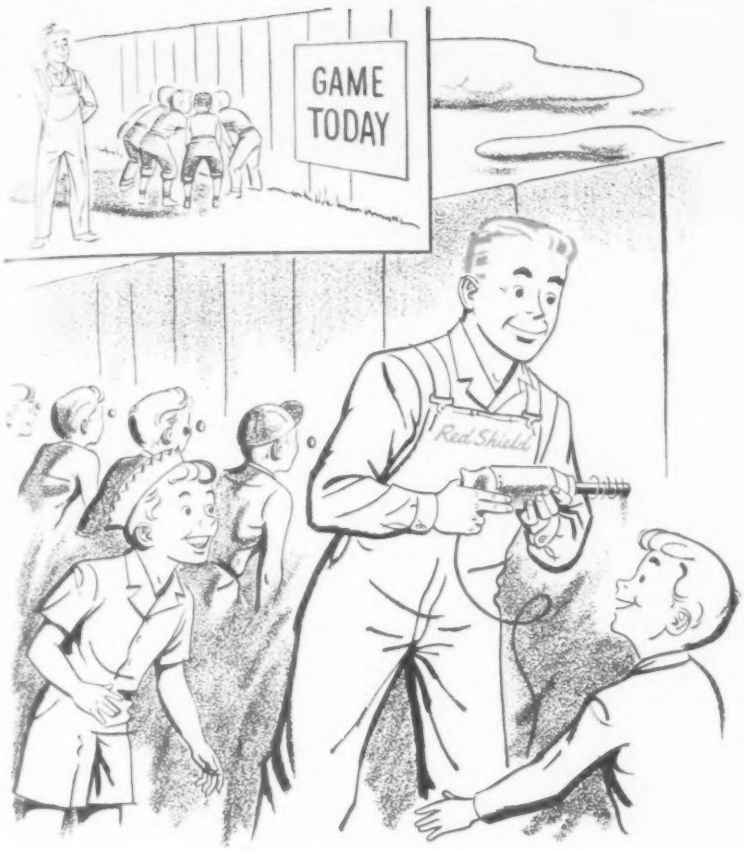
Name_____

Company_____ Position_____

Address_____

City_____ Zone____ State_____

To Obtain Further Information About Advertisers, Trade Literature or Tools of Today Appearing in this Issue of The Tool Engineer, Use the Handy Readers Service Card on Page 101.

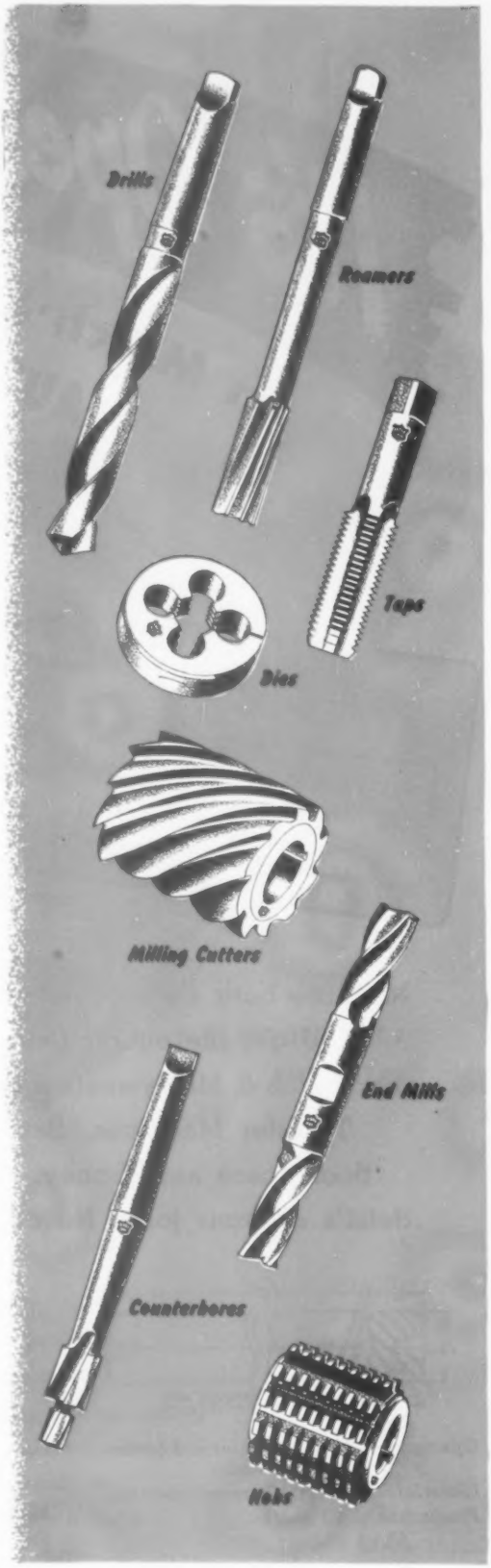


Fast Production

makes everybody happy

FOREMOST quality in design, workmanship and material makes Standard Shield Brand Tools the key to fast, uninterrupted production.

Our 71 years' accumulated experience in solving tough drilling and metal cutting problems is available to you through Standard Red Shield Representatives without cost or obligation. Call or write



STANDARD TOOL CO.

DEPT. 9-F, 3950 CHESTER AVENUE
CLEVELAND 14, OHIO

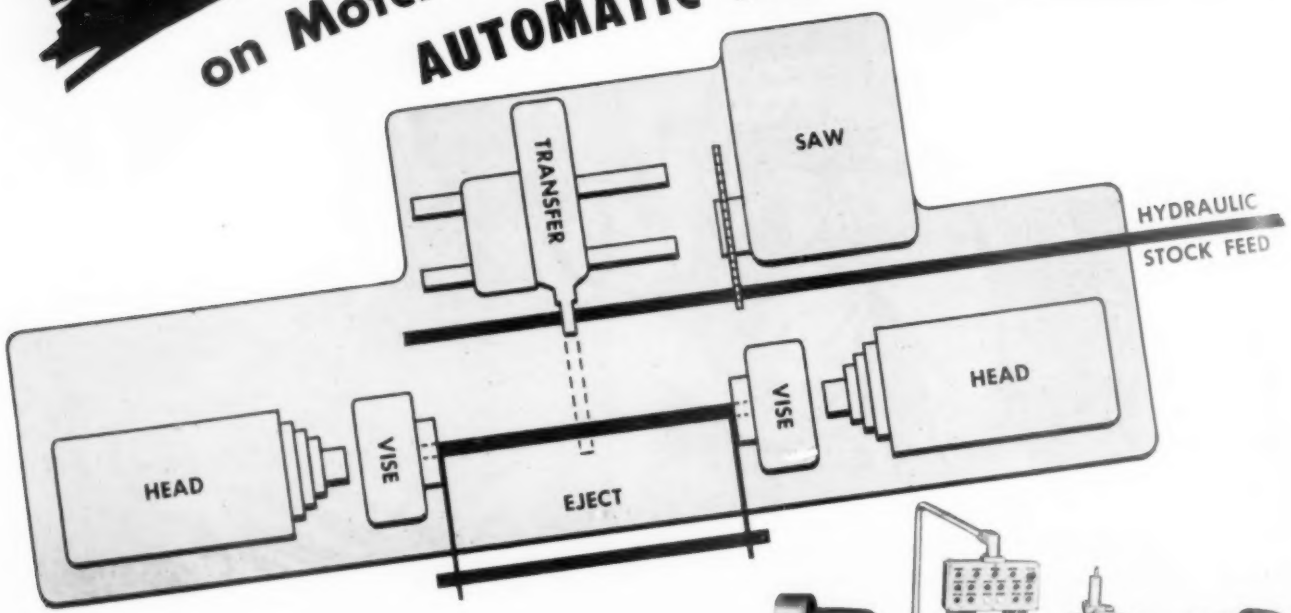
New York • Detroit • Chicago • San Francisco

STANDARD TOOL CO.

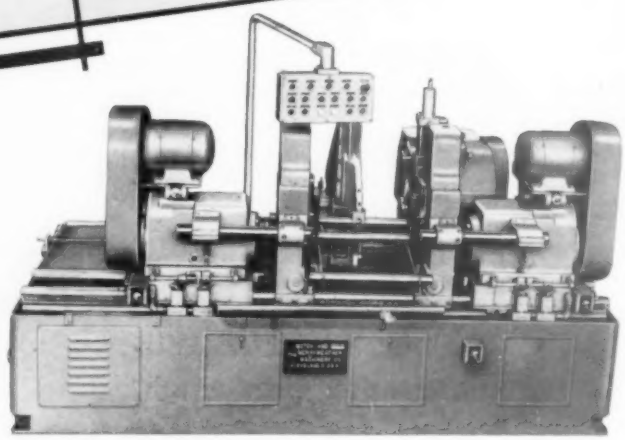
STANDARDIZE AND SAVE WITH STANDARD RED SHIELD METAL CUTTING TOOLS. STANDARD DISTRIBUTORS IN MORE THAN 500 CITIES CAN SUPPLY YOUR REQUIREMENTS.

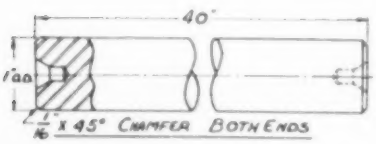
It's "Operation Combine"

on Motch & Merryweather AUTOMATIC TRANSFER MACHINES!

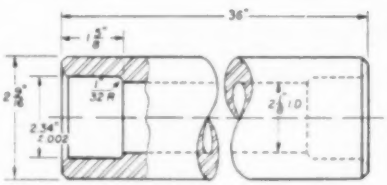


Machine both ends simultaneously and get the cut-off time free on Motch & Merryweather Automatic Transfer Machines. Save time, floor space and money. Get the details on your jobs! No obligation.

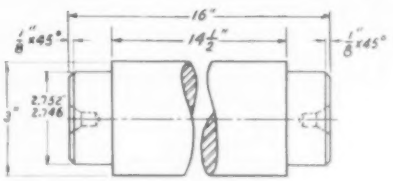




Operation: Cut off, chamfer and center drill both ends.
Material: SAE 1040 ground shafting.
Production: 240 pcs/hr.



Operation: Cut off; bore and chamfer inside and outside, both ends.
Material: SAE 1020 steel tubing.
Production: 140 pcs/hr. @ 100% eff.

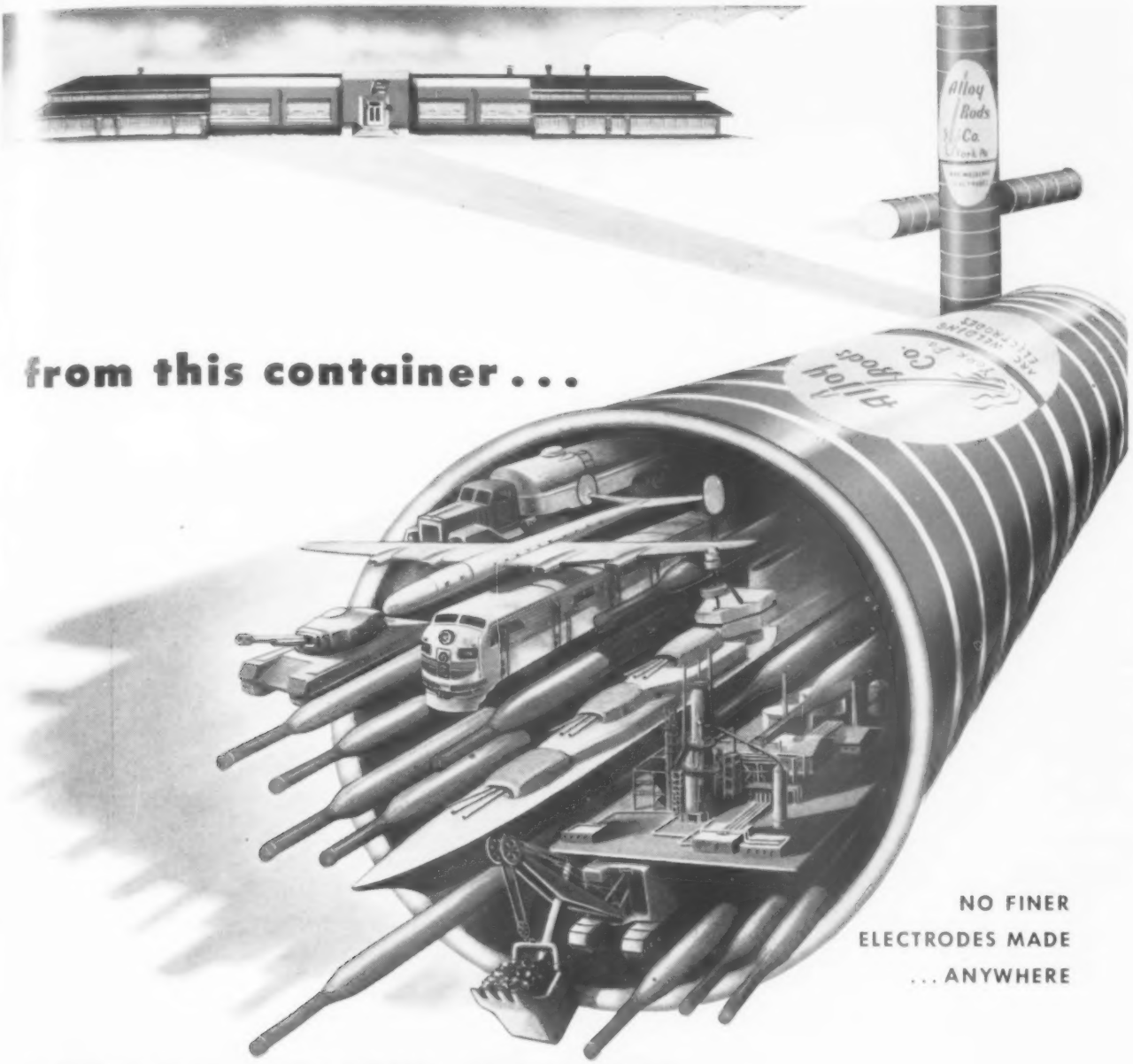


Operation: Cut off, box mill, turn and center drill both ends.
Material: SAE 1020.
Production: 140 pcs/hr.

Manufactured by

THE MOTCH & MERRYWEATHER MACHINERY COMPANY
715 PENTON BUILDING • CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT



NO FINER
ELECTRODES MADE
. . . ANYWHERE

PRODUCTION MAGIC!

Where would American production be without Welding?

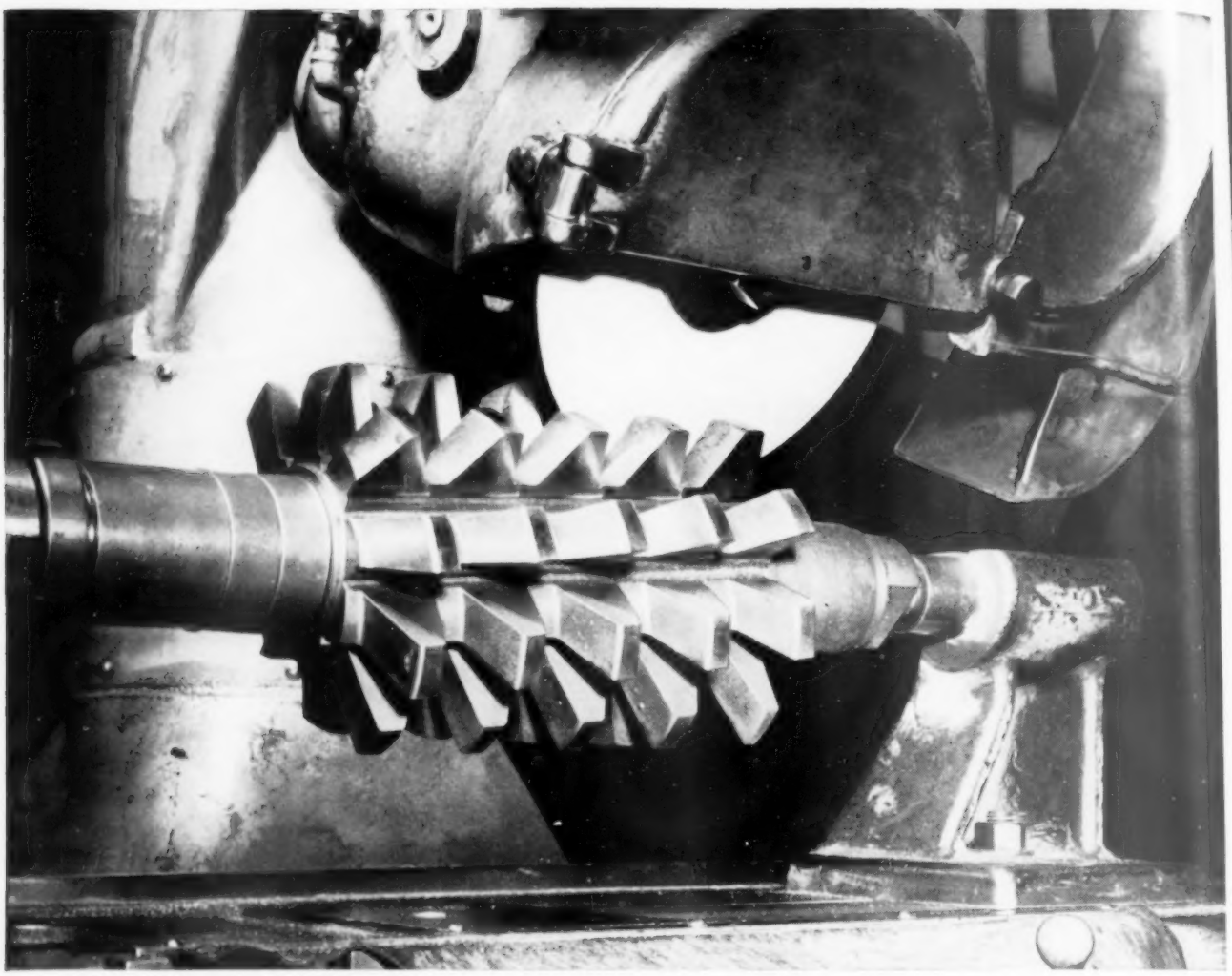
The planes, tanks, and ships . . . the petroleum that powers and warms a nation . . . the periodicals you read and the paper you write on . . . the railroads that span our country . . . the equipment that builds our roads, mines our coal, iron, and minerals . . . the clothes you wear . . . even the food you eat and milk you drink . . . these and the machinery that produces them **all depend on welding.** An arc welded alloy product is a better product. And **Alloy Rods** alloy arc welding electrodes in the familiar red metal containers are the **best** the world affords.

Alloy Rods Co.

AR-6

ALLOY RODS COMPANY, YORK, PENNSYLVANIA

ARCALOY for stainless steel • **ARMORARC** for armor welding • **BRONZE-ARC** for bronze and cast iron • **NICKEL-ARC** for cast iron • **TOOL-ARC** for tool steel • **WEAR-ARC** for hard-facing • **WELD-ARC** for low hydrogen electrodes. **Write for specific bulletins, or consult your Alloy Rods distributor.**

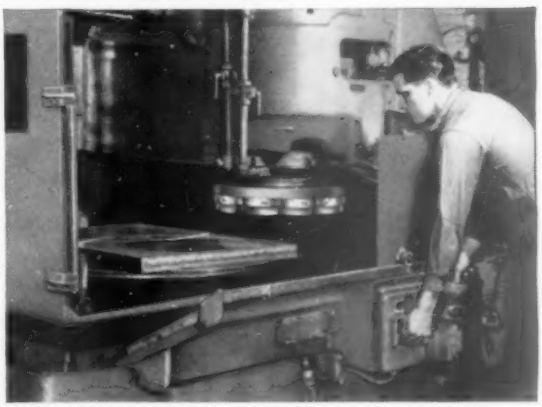


Large hobs with 1½" or greater pitch may be ground with a 10" x 1" x 1" WA464-J2V Robertson Wheel. On smaller hobs, a Robertson 7" x ⅝" x ¾" WA602-JV will give satisfactory service. You can expect a greater saving in grinding time, due to proper chip clearance and cool, free cutting action.

GRINDING TIME HAS BEEN REDUCED AS MUCH AS 50% WITH ROBERTSON COOL-CUT GRINDING WHEELS

The record of Robertson Wheels has been outstanding. Users in hundreds of plants, performing many different operations, report that these unique open structure wheels reduce grinding time by 50 percent or more, increase production 3 to 5 times per wheel dressing, provide longer wheel life than conventional wheels.

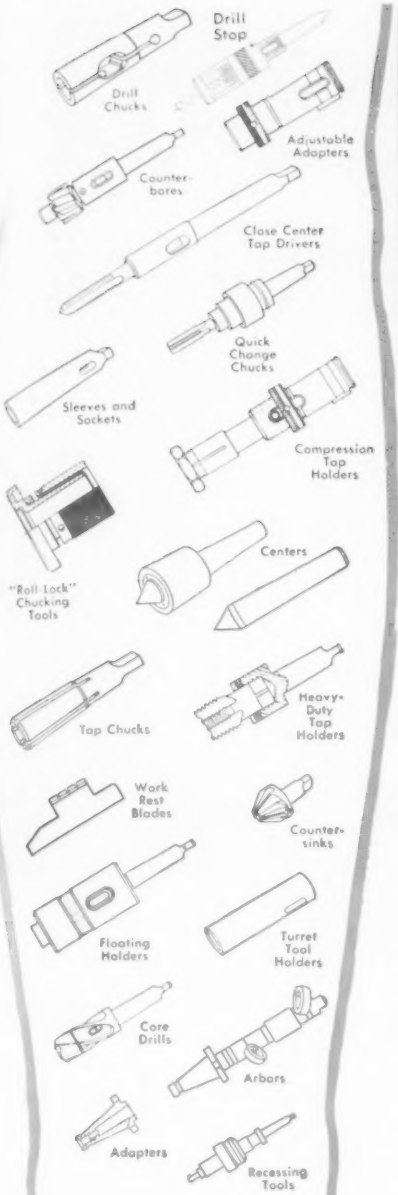
For proof that Robertson Wheels take the toughest jobs in their stride, *blueprint* your grinding problem and let us recommend the proper wheel for your job. You'll like the results you get.



Removing .050" from one side of a 30" x 30" boiler plate required 45 minutes with a conventional grinding wheel. Equipping the surface grinder with a Robertson Cool-Cut Segmental Wheel reduced grinding time to 20 minutes. Robertson Wheels provide fast, cool cutting action on the toughest of operations.

ROBERTSON MANUFACTURING COMPANY
TRENTON 5, NEW JERSEY

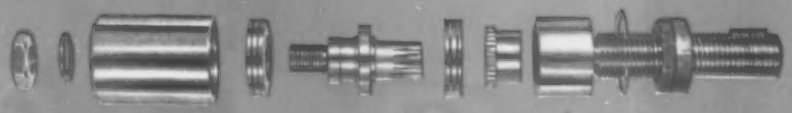
Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments



the "ARMS and HANDS" for your MACHINE TOOLS

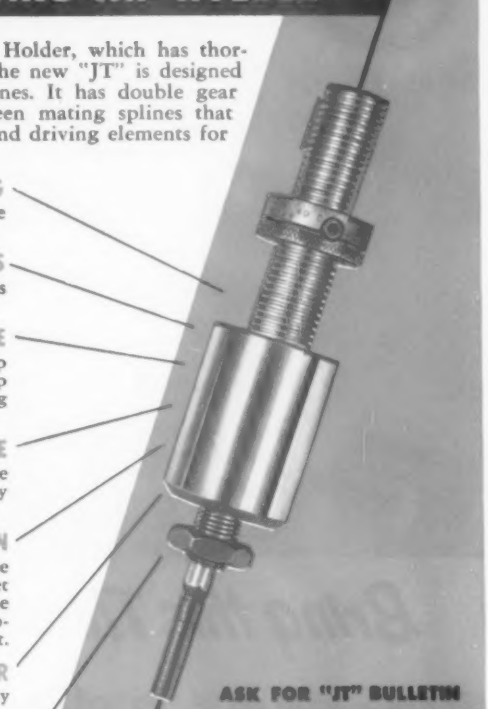
If you think of a Lathe, Mill, Multi-Spindle Machine, or other Machine Tools as being a human body, supplying power to the parts of the body doing the actual work, then Scully-Jones tools represent the "Arms and Hands"

FOR MULTIPLE SPINDLE MACHINES



NEW SJ SCULLY-JONES "JT" FLOATING TAP HOLDER

Comparable to the "JA" Floating Holder, which has thoroughly proven itself in the field, the new "JT" is designed for use in multiple spindle machines. It has double gear spline drive, with clearance between mating splines that allows free movement of floating and driving elements for uniform tapping operations.



LESS OVERHANG
The short projection requires less space between spindle and work.

WORK ON CLOSE CENTERS
Small body diameter permits operations on close centers.

REDUCES TAP DAMAGE
Collet is split on 4 sides; centers tap by the shank, reducing strain and tap damage. Thrust bearings permit cutting tools to float freely into alignment.

SHORTENS SET-UP TIME
Quick-Lock Nut Locks any place on the threaded adapter shank, making it easy to adjust for depth.

TROUBLE-FREE OPERATION
Balls, in the 2 thrust bearings, are free to move or rotate around the collet because they are separated from the drive. This reduces destructive scrubbing action which prevents free float.

REDUCES WEAR
Wear of floating elements is practically eliminated, due to positive lubrication of all parts during operation.

SHUTS OUT DIRT
Outer shell with its "O" ring is a perfect seal to retain lubricant and keep out chips and dirt.

ASK FOR "JT" BULLETIN

Scully-Jones AND COMPANY

1915 So. Rockwell St., Chicago 8, Ill.

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

YOUR PROBLEMS ARE OUR PROBLEMS

Helping you solve your tooling and production problems is Scully-Jones first objective. Ever since 1912 we have designed, developed and manufactured tools to the highest standards to help you get fast, accurate production at low cost.

That is why you can purchase S-J Tools and get the best that engineering research, modern equipment, correct materials and expert workmanship can produce.

Use these S-J "Arms and Hands" to equip your machine tools. They will help you get low cost, fast, accurate production on such operations as drilling, reaming, tapping, milling, counterboring, countersinking, core drilling, recessing or undercutting, boring and grinding.

For current information on S-J Tools, refer to Catalog 600. Write on your company letterhead for your copy.

Let us help you solve your tooling and production problems. Because our manufacturing facilities have been expanded, we're in a position to give you reasonable deliveries. For quick service see our nearest representative or contact Scully-Jones direct.

WHEREVER TOOL STEELS ARE APPLIED . . .

Bring this Third Man into the picture

to give . . . tooling and production a new lift!

He brings to your shop a personalized program *expressly developed* to give you more production returns from every hour, dollar and pound of steel you invest in tools and dies!

He brings you practical, *proven* methods that add speed and sureness to the hands of toolmakers and heat treaters. He makes available new ideas to add hours of service life to tools and dies, reduce machine downtime and squeeze *more* from existing plant facilities. He is your Carpenter representative, bringing you Carpenter's personalized service program . . . at no extra cost.

Look what backs his call to your shop: Time-saving data from constant Carpenter laboratory research, issued in regular Service Bulletins. More than 60 years of experience in applying tool steels, made available in Carpenter's Matched Tool and Die Steel Manual. Timely tips on getting more from present heat treating equipment, yours in a new slide chart. Modern, *visual* slide films to refresh skilled men and train apprentices.

Ask *your* friends in the business what Carpenter's personalized program has meant to them. Then, knowing how it can help *you* meet today's critical demands for more output, start now to put it in motion.

THE CARPENTER STEEL COMPANY
133 W. Bern Street, Reading, Pa.

Call your Carpenter Representative for this Personalized Program on

Carpenter

MATCHED TOOL & DIE STEELS

DON'T WAIT... COOPERATE!
The U.S. Needs Your Steel Scrap, Now

Export Department: Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

Mill-Branch Warehouses and Distributors in Principal Cities Throughout the U. S. A. and Canada

SO D STEEL HE DS, CAPS nd OUNTINGS MA HINED from OLID BAR STOCK

HARD CHROME PLATED PISTON RODS

DIRT WIPER SEALS

NON-CORROSIVE BRASS BARRELS

Miller TRADE MARK REGISTERED

AIR CYLINDERS

Benefits to You

No Broken Castings
No Scratch-Damage to Piston Rods, Bushings and Seals

NO COSTLY "DOWNTIME"
NO REPAIRS
NO MAINTENANCE
NO POWER WASTAGE

FOUR-WEEK DELIVERY

To Meet Your

RUSH

Cylinder Requirements

. . . now assured by our modern new plant with greatly expanded facilities—devoted exclusively to the manufacture of quality cylinders.

Write for illustrated cylinder bulletins A-105 and H-104

COMPLETE MILLER CYLINDER LINE INCLUDES: AIR CYLINDERS, 1½" to 20" BORES, 200 PSI OPERATION; LOW PRESSURE HYDRAULIC CYLINDERS, 1½" TO 6" BORES FOR 500 PSI OPERATION, 8" TO 14" BORES FO 250 PSI; HIGH PRESSURE HYDRAULIC CYLINDERS, 1½" TO 12" BORES, 2000-3000 PSI OPERATION. AL MOUNTING STYLES AVAILABLE.

Miller

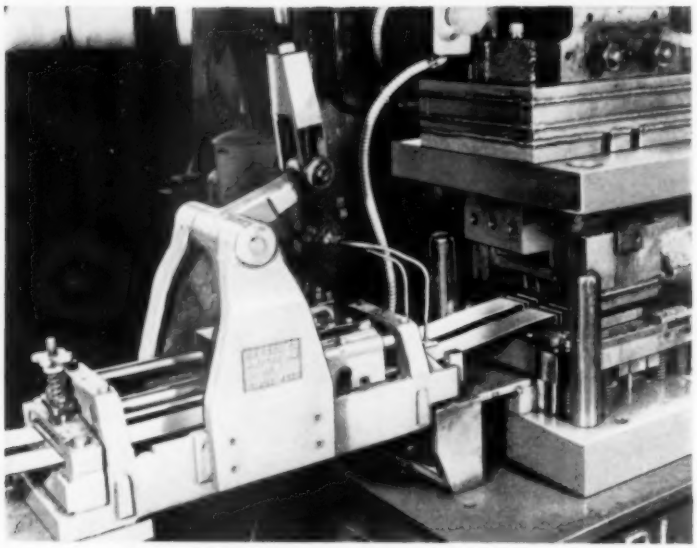
MILLER MOTOR COMPANY

2010 N. HAWTHORNE AVE. • MELROSE PARK, ILL

AIR AND HYDRAULIC CYLINDERS · ACCUMULATORS · COUNTERBALANCE CYLINDERS · BOOSTERS · AIR HOI

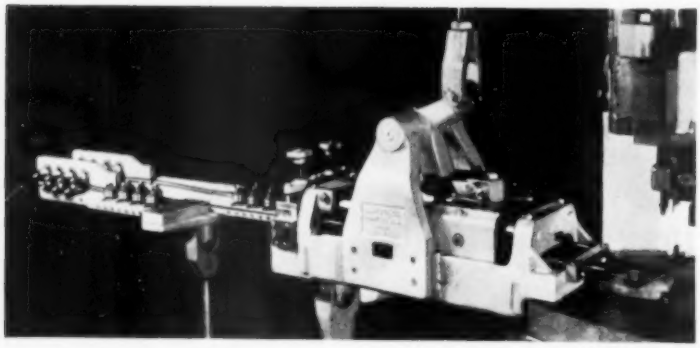
CLEVELAND — PITTSBURGH — PHILADELPHIA — DETROIT — YOUNGSTOWN — BOSTON
HARTFORD — NEW YORK CITY — DAYTON — ST. PAUL — FORT WAYNE — INDIANAPOLIS
MILWAUKEE — NASHVILLE — SEATTLE — LOS ANGELES — SAN FRANCISCO — BALTIMORE
ST. LOUIS and OTHER AREAS.

Sales and Service from coast to coast



The Answer to Your Press Feed Problems

U. S. Slide Feeds



Do you want to feed thin material? Thick Material? Flat wire? Round wire? Irregular cross-sections? Two strips at a time? Whatever the job, there's a U. S. Slide Feed that can do it.

In addition to their main feature—Controlled Accuracy—U. S. Slide Feeds are highly versatile, and can be used for feeding such materials as:

1. Flat stock (steel, brass, copper, aluminum, etc.)
2. Flat stock (paper, fibre, wire cloth, etc.)
3. Stock with tapered or irregular cross-section.
4. Round, square or hexagon-shaped wire.

Although primarily designed for feeding stock which comes in coils, the U. S. Slide Feed can be arranged for butt-feeding stock which comes in short lengths, when the thickness is over .030" and the material is of sufficient stiffness.

U. S. Slide Feeds can be used to feed more than one strip at the same time. In both of the setups shown the stock is being fed two strips at a time, thus greatly increasing production output.

U. S. Slide Feeds can pull stock through a plain straightener and maintain controlled accuracy.

For descriptions of U. S. Slide Feeds, U. S. Roll Feeds, U. S. Straighteners, U. S. Stock Reels and U. S. Coil Cradles ask for a copy of Bulletin No. 80-E.

US PRODUCTS

U. S. TOOL COMPANY, Inc.

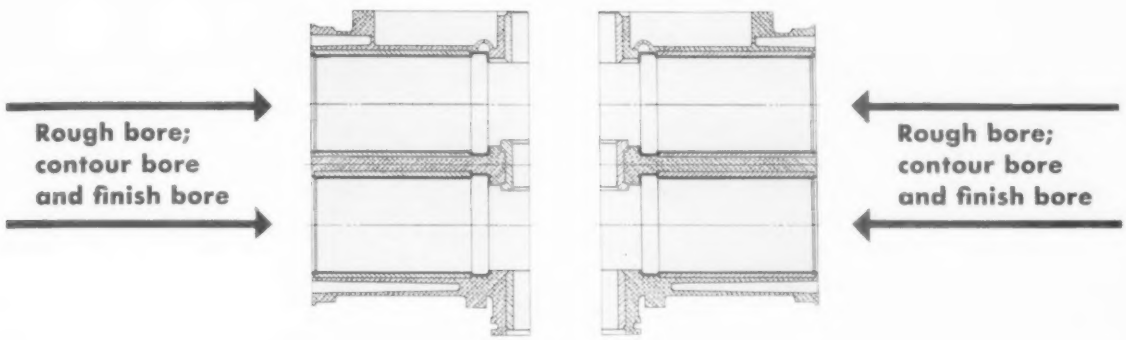
AMPERE (East Orange) NEW JERSEY

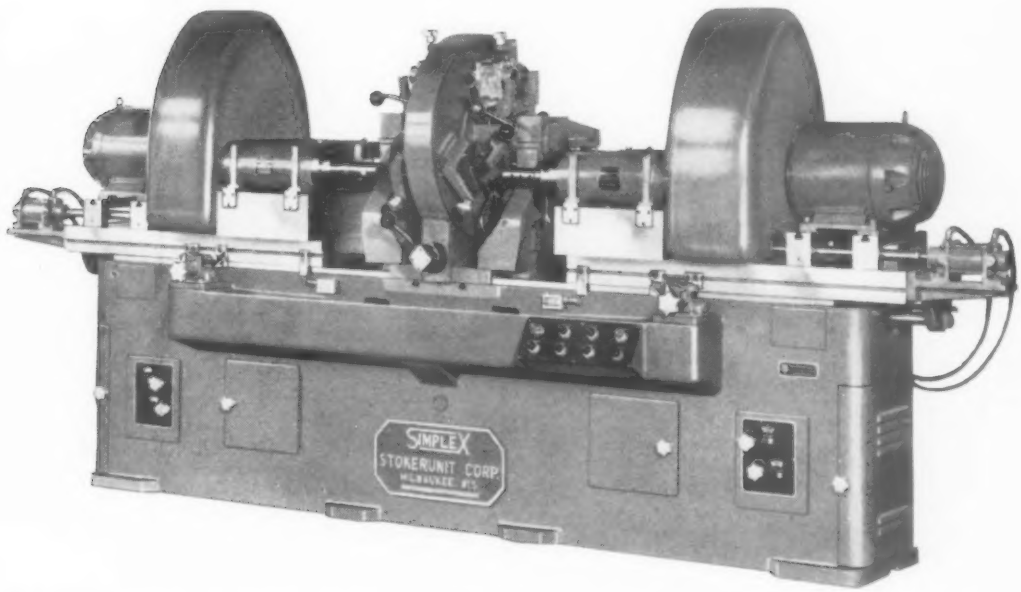
Builders of U. S. Multi-Slides—U. S. Multi-Millers

U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

Simplex MACHINES .. Work Twice as Hard for You!

Simultaneous Boring of Two Parts





To perform the operations shown above, a leading manufacturer of outboard motors acquired the above machine, tooled to give him maximum production. A trunnion type indexing fixture of which both sides were used, permitting the rough boring, contour boring and finish boring operations on two parts at one time, resulted in one completed piece—four operations—for every cycle of the machine. The machine used was a SIMPLEX 2U 2-Way Hydraulic Feed Precision Boring Machine, equipped with four #3 SIMPLEX Boring Heads, automatic feed-out mechanisms and a six-station trunnion type indexing fixture.

Simplex **PRECISION BORING MACHINES**

SIMPLEX MACHINE TOOL DIVISION
STOKERUNIT CORPORATION
4528 WEST MITCHELL STREET
MILWAUKEE 46, WISCONSIN

PRECISION BORING MACHINES • PLANER TYPE MILLING MACHINES • SPECIAL MACHINE TOOLS

Index of The Tool Engineer Advertisers

July, 1952

The Index to Advertisers is published as a reader service. Although every precaution is taken to assure correct listing, no allowance will be made for error or omission.

*Exhibitor in 1952 ASTE Industrial Exposition

♦User of ASTE Data Sheets

A

*Ace Drill Bushing Co. 157
♦Acme Industrial Co. 180
*Acme Tool Co. 134
*Allegheny Ludlum Steel Corp. 125
*Allen Mfg. Co., The 151
Alloy Rods Co. 199
Aluminum Co. of America 160
American Broach & Machine Co., Division of Sundstrand Machine Tool Co. 170
American Drill Bushing Co. 155
*American Pullmax Co. 111
*American Society of Tool Engineers 158
*American Wheelabrator & Equipment Corp. 98
*Anderson, F. E., Oil Co. 97
A-P Controls Corp. 118
Apex Tool & Cutter Co., The 184
*Arrow Tool & Reamer Co. 192
*Atlas Press Co., Clausing Division 186
*Atrax Co. 127
*Automatic Steel Products, Inc. Subsidiary Cleveland Tapping Machine Co., The 113

B

Baker Brothers, Inc. 12
Balas Collet Mfg. Co. 208
Barksdale Valves 166
Barnes, W. O., Co. 158
Bath, John, Co., Inc. 173
*Baumbach, E. A., Mfg. Co. 21
*Bay State Abrasive Products 136-137
Bay State Tap & Die Co. 180
Behr-Manning Corp. 147
*Bellows Co., The 26
Besley-Welles Corp. 195
Bethlehem Steel Co. 189
*Brown & Sharpe Mfg. Co. 123-124

C

*Cadillac Stamp Co. 130
Capitol Machinery Corp. 180
*Carborundum Co., The 14-15
Carpenter Steel Co. 202
*Chicago Tool & Engineering Co. 196
*Chicago Wheel & Mfg. Co. 88
Cincinnati Shaper Co., The 16
*Circular Tool Co. 117
Cleveland Industrial Tool Co. 184
*Cleveland Tapping Machine Co., The Automatic Steel Products, Inc., Subsidiary 113
Cleveland Twist Drill Co. 179
Columbia Tool Steel Co. 104
Cone Automatic Machine Co. 171
*Cosa Corp. 152
*Crucible Steel Co. of America 159
Cushman Chuck Co., The 131

D

*Danly Machine Specialties, Inc. 133
Denison Engineering Co., The 146-207
*Detroit Stamping Co. 114
*Dilley Mfg. Co., The 103
*Do-All Co., The 148-149
Dykem Co., The 158

E

*Eastman Kodak Co., Industrial Optical Sales Div. 165
*Eclipse Counterbore Co. 108
*Enco Mfg. Co. 184
*Engis Equipment Co. 88
*Erickson Tools Division 89
*Ex-Cell-O Corp. Inside Back Cover

F

*Federal Products Corp. 156
Fellows Gear Shaper Co. 196
Ferguson Machine & Tool Co. 192

G

*Gairing Tool Co., The 106
*Galland-Henning Mfg. Co. 145
*Gammons-Hoaglund Co. 207
Gay-Lee Co. 92
Gisholt Machine Co. 17-18-19-20
Geometric Tool Co., Division Greenfield Tap & Die Corp. 175-176
Golconda Corp. 94
Gorham Tool Co. 96
Graham Mintel Instrument Co. 112
Greenfield Tap & Die Corp. 175-176
Grinding Wheel Institute 174
*Grobet File Company of America 145

H

*Handy & Harman 181
*Hannifin Corp. 163
*Hardinge Brothers, Inc. 3
Hassall, John, Inc. 114
Heald Machine Co., The Inside Front Cover
Howe & Fant, Inc. 121

I

*Ingersoll-Rand Co. 185

J

Jahn, B., Mfg. Co. 90
*♦Jones & Lamson Machine Co. 139

K

*Kearney Trecker Corp., Walker-Turner Division 172
Keller Tool Co. 144
Kempsmith Machine Co. 105
*Kennametal, Inc. 100
Kling Brothers Engineering Works 28
*Klingelhofer Machine Tool Co. 178

L

*Landis Machine Co. 2
Lapointe Machine Co., The 23
*Latrobe Electric Steel Co. 32
Lavallee & Ide, Inc. 103
*Lee, K. O., Co. 130
*Lindberg Engineering Co. 168
*Lipe-Rollway Corp. 110
Lucas Machine Division New Britain Machine Co. 143
Lockheed Aircraft Corp. 92

M

Madison Manufacturing Co. 196
*Manhattan Rubber Division Raybestos-Manhattan, Inc. 140
*Matthews, James H., & Co. 145
Meehanite Metal Corp. 187
*Metal Carbides Corp. 22
Micromatic Hone Corp. 167
Milford Rivet & Machine Co. 93
*Miller Motor Co. 203
*Milne, A., & Co. 119
Moline Tool Company, The 158
Morse Twist Drill & Machine Co. 24-25
Motch & Merryweather Machinery Co. 198

N

National Automatic Tool Co. 128-129
*National Broach & Machine Co. 162
*National Tool Co. 161
♦National Twist Drill & Tool Co. 6-7
New Britain-Gridley Machine Division, The New Britain Machine Co. 164
*Niles-Bement-Pont Co., Pratt and Whitney Division 4-27
*Norton Co., The Machine Division 10-11
Newcomer Products, Inc. 95
Neise, Karl A. 192

O

*Oakite Products, Inc. 153
*Ortman-Miller Machine Co. 191
Ottemiller, W. H. Co. 192

P

ker-Kalon Corp. 169
ker-Majestic, Inc. 188
neer Engineering & Mfg. Co. 91
neer Pump & Mfg. Co. 91
neer Tool & Engineering Co. 95
tter & Johnston Co.,
Subsidiary of Pratt & Whitney Division
Niles-Bement-Pond Co. 126
Pratt & Whitney Division
Niles-Bement-Pond Co. 4-27
*Precise Products Co. 153
Paramount Engineering Co. 196

R

*R and L Tools, Inc. 190
*Raybestos-Manhattan, Inc.,
Manhattan Rubber Division 140
*Ready Tool Co. 153
*Richards, J. A. Co. 192
Ringler, F. A. Co. 99
Robertson Mfg. Co. 200
Russell, Holbrook & Henderson, Inc. 193
Ruthman Machinery Co. 157

S

*Scherr, George, Co., Inc. 158
*♦Scully-Jones Co. 201
Seneca Falls Machine Co. 182-183
*Service Machine Co. 134
*Severance Tool Industries, Inc. 130
*Sheldon Machine Co. 86
Sidney Machine Tool Co. 154
*Simplex Machine Tool Division
Stokerunit Corp. 205
Skinner Chuck Co. 107
Snow Mfg. Co. 109
*Standard Electrical Tool Co. 116
*Standard Gage Co., Inc. 5
*Standard Pressed Steel Corp. 138
Standard Tool Co. 197
*♦Starrett, L. S., Co., The 13
*Stocker & Yale Co., Inc. 194
*Stokerunit Corp.
Simplex Machine Division 205
*Stuart, D. A., Oil Co., Ltd. 177
Sun Oil Co. 30
Sunstrand Machine Tool Co. 8-9
Sundstrand Machine Tool Co.
American Broach & Machine Co., Division 170

T

Thompson, Henry G., & Son, Co. 87
Threadwell Tap & Die Co. 141-142
*Torit Mfg. Co. 132

U

U. S. Tool Co., Inc. 204

V

*Vanadium-Alloys Steel Co. 135
Victor Machinery Exchange 134
*Viking Industries 132

W

*Wales-Strippit Corp. ..... Back Cover
Walker, O. S. Co., Inc. 120
*Walker-Turner Division,
Kearney Trecker Corp. 172
Warner & Swasey Co., The 150
*Waukesha Tool Co. 157
*Wesson Co. 122
Western Tool & Mfg. Co. 132
♦Winter Brothers Co.,
Division of National Twist Drill & Tool Co. 6-7

Z

Zagar Tool Co. 115
Ziegler, W. M., Tool Co. 184

THE TOOL ENGINEER REGIONAL ADVERTISING OFFICES

EASTERN
Austin G. Cragg
400 Madison Ave.
Phone: Plaza 9-4018
New York 17, New York

OHIO
Richard E. Cleary
Commercial Bank Building
Phone: Berea 4-7719
Berea, Ohio

CENTRAL
Clarence T. Etter
10700 Puritan Avenue
Phone: University 4-7300
Detroit 21, Michigan

WESTERN
Stanley F. Girard
540 N. Michigan Ave.
Phone: Michigan 2-4465
Chicago 11, Illinois

PACIFIC COAST
W. R. McIntyre
423 First Trust Bldg.
Phone: Ryan 1-6981
Pasadena 1, California

To Obtain Further Information About Advertisers, Trade Literature or Tools of Today Appearing in this Issue of The Tool Engineer, Use the Handy Readers Service Card on Page 101.

grips work tighter releases work quicker

BENCO COLLET

An important factor to increased production is the speed with which your collets operate. Work gripped tighter reduces "run-outs" and chatter. More production results when stock is released quicker upon the opening of the chuck head.

Benco Collets provide these advantages by being cam-ground on the taper, by the use of selected alloy steels and by proper heat treating. They are engineered to give you more production advantages, longer wearing properties and greater accuracy.

You reduce time lost changing "set-up" when you use Benco Master Collets since the pads are quickly changed without removing the collet from the spindle. "CB" Master Collets use the only pad that is interchangeable with any other pads intended for "CB" Collets of the same machine capacity, regardless of make of machine.

Benco Collets give you production speed and quality at the same time...that's why it pays you to insist on Benco.

BENCO COLLET MANUFACTURING CO.

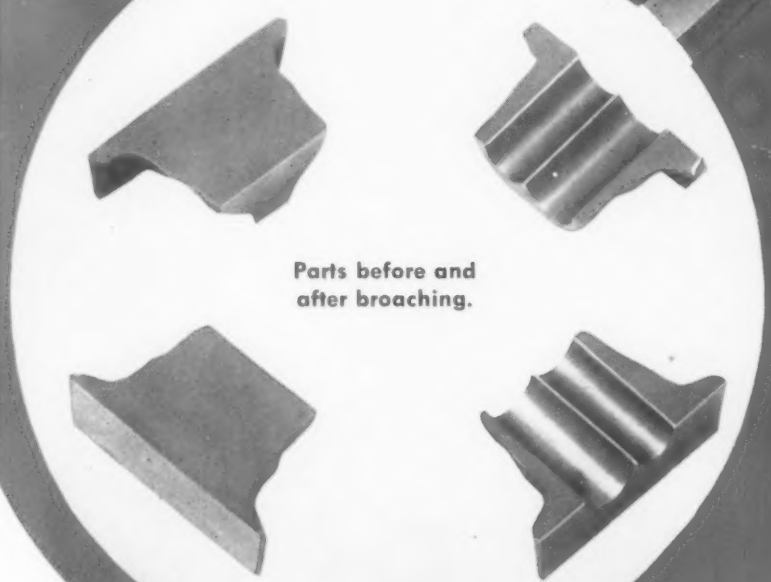
1560 EAST 27th STREET CLEVELAND 14, OHIO

Always Better Constructed Accurate Benco Collets, Pushers and Pads

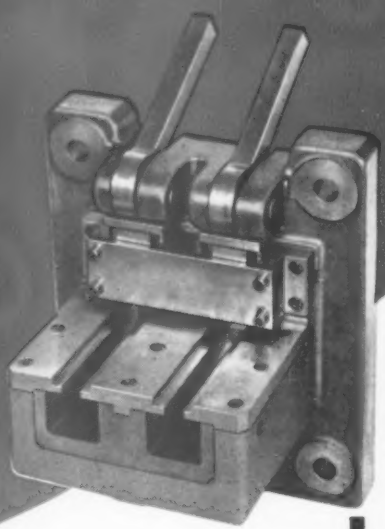
BOOST PRODUCTION...
MAKE DIFFICULT PARTS
Interchangeable

Above: Broaches, consisting of five individual sections mounted in each holder, rough and finish two complete parts per stroke.

Below: Two-station, cam-type clamping fixture guides broaches throughout the cutting stroke.



Parts before and after broaching.



BROACHES BY Continental

The half-round slots in these stainless steel aircraft tubing clamps were formerly drilled and reamed. The process was slow. To make matters worse, no two parts were exactly alike.

Continental engineers designed broaches and fixture to do a completely uniform job in far less time. Parts are now fully interchangeable.

For information on how Continental Broaches may help increase your production, with improved accuracy and finish, call in your local Ex-Cell-O representative, or write, wire or phone Continental in Detroit today.

52-9

CONTINENTAL TOOL WORKS DIVISION OF EX-CELL-O CORPORATION DETROIT 32, MICHIGAN

WHY THERE IS NO
COMPROMISING WI

WALES EQUIPMENT

● Wales expanded line of metal fabricating equipment provides a machine for practically all types of operations . . . punching, notching and nibbling . . . drilling and boring . . . blanking, forming, drawing and beading . . . and shearing.

Standardizing on this versatile Wales line assures the exact type of equipment for various operations. Depending on the number of parts and size and shape of the work, one piece of Wales Equipment is more efficient and economical than the other. To fully determine which Wales Machine is most applicable to your particular type of work, call on Wales Engineers who have had years of experience in the best ways to fabricate parts.

Yes, make it standard practice to call on Wales Engineers FIRST for their valuable time-saving, money-saving suggestions.

WALES-STRIPPIT CORPORATION

George F. Wales, *Chairman*

393 Payne Avenue, North Tonawanda, N. Y.

(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada, Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment